Republic of Iraq
Ministry of Higher Education & Scientific Research
Supervision and Scientific Evaluation Directorate
Quality Assurance and Academic Accreditation

Academic Program Specification Form for the Academic

جامعة البصرة
قسم هندسة المواد
كلية الهندسة

University: University of Basrah
College: College of Engineering
Department: Materials Engineering Department
Date of Form Completion:

Prof.Dr.Ramzy Salim Ali	Assist.Prof.Dr.Haider Maath Mohammad	Dr.Dhia chasib Ali
Dean's Name	Dean's Assistant for Scientific Affairs	Head of Department
Date: 22 / 6 / 2021	Date: / /	Date: / /
Signature	Signature	Signature

Quality Assurance and University Performance Manager
Date: / /
Signature

TEMPLATE FOR PROGRAMME SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

PROGRAM SPECIFICATIO

This programme specification provides a concise summary of the main features of the programme 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 is supported by a specification for each course that contributes to the programme.

1. Teaching Institution	University of Basrah
2. University Department/Centre	Materials Engineering Department
3. Program Title	Materials Engineering
4. Title of Final Award	Bachelor of Materials Engineering
5. Modes of Attendance offered	Semester System
6. Accreditation	ABET
7. Other external influences	Field and scientific visits
8. Date of production/revision of this specification	2021
9. Aims of the Program	
1. Preparing and qualifying specialized engineers to meet the requirements of the labor market in its private and public sectors in material engineering through diversification in methods of learning and teaching and training students to apply the acquired knowledge and skills to solve realistic problems.	
2. Providing distinguished academic programs in the field of material engineering, both theoretical and practical, in order to comply with international standards of academic quality and meet the needs of the labor market.	
3. Encouraging and developing scientific research in the fields of materials engineering in general.	
4. Prepare a stimulating environment for faculty members to develop their educational and research knowledge and skills.	
5. Building and developing partnership with governmental and private sectors and society in all its various institutions.	

10. Learning Outcomes, Teaching, Learning and Assessment Methods

A. Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed

on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

Assessment methods

• Active participation in the classroom, a guide to the student's commitment and responsibility.
• Commitment to the deadline in submitting the duties and research required of the student to submit them.
• The quarterly and final exams express commitment and cognitive and skill achievement.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

11. Admission standard (development of college or institute admission regulations)

Rate: At least 90%

Age: No more than 25 years

Number: Up to 50 students per year

12. Key sources of information about the program

1- The websites of Iraqi and international universities.
2- The workshops held by the Ministry of Higher Education in addition to the Ministry's standards.
3- The American Academic Accreditation Program (ABET).

Curriculum Skills Map																		
please tick in the relevant boxes where individual Programme Learning Outcomes are being assessed																		
Programme Learning Outcomes																		
Year / Level	Course Code	Course Title	Core (C) Title or Option (O)	Knowledge and understanding				Subject-specific skills					Thinking Skills				General and Transferable Skills (or) Other skills relevant to employability and personal development			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	C5	D1	D2	D3	D4
first class	MAE115	Principles of Engineering Materials	essential	×	×		×	×	×	×	×	×	×	×	×		×			×
First class	MAE113	Materials Extraction Technology	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
First class	**MAE123**	Materials Extraction Technology	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
1st.class	U116	Principles of Computer Science	Election	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
First year	MAE114	Electrical Engineering Matetial	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
First class	MAE122	Engineering mechanics /Dynamic	Fundamental	×	×		×	×	×	×	×	×	×	×	×		×			×
First class	MAE112	Engineering mechanics	Fundamental	×	×		×	×	×	×	×	×	×	×	×		×			×

		/static																		
First class	U126	VB Programming	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Second class	MAE216	Introduction to computer programming	Foundation.	×	×	×		×	×	×	×	×	×	×	×		×		×	×
Second class	MAE226	Computer programming	Foundation.	×	×	×		×	×	×	×	×	×	×	×		×		×	×
Second class	MAE224	Strength of Materials	Foundation.	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Second class	MAE214	Mechanics of Materials	Foundation.	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Second class	E221	Mathematics II	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Second class	E210	Mathematics I	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
second class	**MAEXXX**	Chemical Metallugy	Foundation.	×	×	**x**	×	×	×	×	×	×	×	×	×	**x**	×	**x**	**x**	×
Second class	**. . . MAE**	Mechanical Drawings	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Second class	**xx0078**	Metallurgical thermodynamic	Foundation.	×	×	**x**	×	×	×	×	×	×	×	×	×	**x**	×	**x**	**x**	×
Third class	MAE315	Ceramic Materials	Foundation	×	×	×		×	×	×		×	×	×	×	×	×	×	×	×
Third class	MAE317	Conduction Heat	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×

		Transfer																		
Third class	MAE327	Convection Heat Transfer	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Third class	MAE 326	Corrosion II	Foundation	×	×	×		×	×	×		×	×	×	×	×	×	×	×	×
Third class	MAE324	Cutting and welding	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Third class	MAE314	Engineering Materials Technology	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Third class	MAE325	Polymers Engineering	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Third class	MAE322	Failure of Engineering Materials	Foundation.	×	×	×	×	×	×	×	×	×	×	×	×		×			×
Third class	MAE000	Engineering Analysis	Foundation.	×	×	×	×	×	×		×	×	×	×	×		×			×
Third class	MAE000	Engineering Analysis	Foundation.	×	×	×	×	×	×		×	×	×	×	×		×			×
Third class	MAE313	Heat Treatment of Ferrous Metals	Foundation.	×	×	×	×	×	×		×	×	×	×	×		×			×
Third class	MAE323	Heat Treatment of Non Ferrous Metals	Foundation.	×	×	×	×	×	×		×	×	×	×	×		×			×
Third class	**MAE3**12	Behavior of Engineering Materials	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×

Second class	**…MAE**	Mechanical Drawings	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Third class	**MAE318**	laboratories	Foundation.	×	×	×	×	×	×	×	×	×	×	×	×		×			×
Third class	**MAE328**	laboratories	Foundation.	×	×	×	×	×	×	×	×	×	×	×	×		×			×
Forth class	MAE416	Industrial Engineering	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Fourth year	MAE425	Nanomaterials	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Fourth class	MAE414	Powder metallurgy	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Forth class	MAE413	Composite Materials	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Fourth class	MAE421	Selection of Eng. Mat. For Desgin	Foundation.	×	×	×	×	×	×	×	×	×	×		×		×	×	×	×
Fourth class	MAE422	X-Ray Diffraction and Microscopy	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Fourth class	MAE426	Project Management	Election	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Fourth class	MAE412	Non Destructive Testing	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Fourth stage	MAE411	Mechanical design	Foundation.	×	×		×	×	×	×	×	×	×	×	×		×			×
Fourth class	MAE 423	Advanced materials	Foundation.	×	×	×	×	×	×		×	×	×	×	×		×			×
Fourth class	MAE 415	CAD/CAM	Foundation.	×	×	×	×	×	×	×	×	×	×	×	×	×	×		×	×

Fourth Stage	**MAE418**	laboratories	Foundation.	×	×	×	×	×	×	×	×	×	×	×	×		×			×
Fourth Stage	**MAE428**	laboratories	Foundation.	×	×	×	×	×	×	×	×	×	×	×	×		×			×

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides an introduction to the basic principles of materials science necessary to interpret and solve engineering problems by identifying and diagnosing defects and the possibility of solving the problem and question in an engineering manner based on engineering principles, as the course provides a mechanism for dealing with the crystal structure of engineering materials and phase diagrams.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Principles of Engineering Materials/ MAE115
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 1st Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to this fundamental area of materials engineering which enables students to focus on the study of atomic structure,-Imperfections in the atomic and ionic arrangements, defects in materials such as dislocations, applications of diffusion, Stability of Atoms and Ions, Mechanisms for Diffusion. The course exposes students to the : Phases and the Phase Diagram, Solubility and Solid Solutions, Conditions for Unlimited Solid Solubility, Solid-Solution Strengthening, Isomorphous Phase Diagrams, Relationship Between Properties and the Phase Diagram, Solidification of a Solid-Solution Alloy, Nonequilibrium Solidification and Segregation, Intermetallic Compounds. These principals allow the students to assess what could be achieved through this course when they are identifying failuer to solve problems in manufacturing.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and

interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Weldability effecting factors, Physical and chemical properties of welding, Classification of welding process,	Welding	theoretical	Questions and discussion
Second	2	Condition for obtaining satisfactory welds, Welding quality and performance, Selection of welding process and filler metal,	Welding	theoretical	Questions and discussion
Third	2	Type of Arc Welding, High Frequency Resistance Welding, Solid Phase Welding, Ultrasonic Welding,	Welding	theoretical	Questions and discussion
Fourth	2	Explosive Welding, High Energy Density Welding Process, Laser Beam Welding, Electron Beam Welding, Calculation of welding Parameters,	Welding	Theoretical + tutorial	Questions and discussion
Five	2	Definition, Classification, Castable Materials, Casting Process of Metals	Primary Shaping	Theoretical	Questions and discussion
Sixth	2	Classification, Cemented Carbide High Speed Steel, High Carbon Steel, Cast	Cutting Tool Materials	Theoretical + tutorial	Questions and discussion
Seventh	2	Nonferrous Alloy, Diamond, Ceramic, Cermets, Cutting Tool Geometry, Wear and Tool Life, Coolants	Cutting Tool Materials	Theoretical +	Questions and discussion
Eighth	2	Classification, Definition, Process and requirements, Distribution of temperatures	Cutting with geometrically defined cutting edges	Theoretical +	Questions and discussion
Ninth	2	Types and requirements, Types of clamping , Hybrid Turning Machine , Drilling Process,	geometrically defined cutting edges	Theoretical + tutorial	Questions and discussion

		Milling, Tapping , Advantages and disadvantages, Broaching, Shapers, Planers.			
Tenth	2	Classification, Grinding, Types of Abrasives, wear, Advantages and Disadvantages of Honing, Lapping, Double Wheel Grinding .	Cutting with geometrically undefined cutting edges	Theoretical + tutorial	Questions and discussion
Eleventh	2	Classification, Grinding, Types of Abrasives, wear, Advantages and	Cutting with geometrically undefined cutting edges	Theoretical + tutorial	Questions and discussion
Twelfth	2	Disadvantages of Honing,Lapping, Double Wheel Grinding	Cutting with geometrically undefined cutting edges	Theoretical + tutorial	Questions and discussion
Thirteenth	2	Classification, Chemical removal, Types, Etching, Thermal removal, Classification,	Non-Conventional Cutting Technology	Theoretical + tutorial	Questions and discussion
Fourteenth	2	Electrical Discharges Machining EDM, Material removal mechanism Surface formation,	Non-Conventional Cutting Technology	Theoretical + tutorial	Questions and discussion
Fifteenth	2	Wire EDM, Manufacturing system of wire EDM, Laser machining, Types, Laser mechanism , Laser source, Electrochemical removal.	Non-Conventional Cutting Technology	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of materials extraction necessary to explain the sources of minerals in nature and its liberation and concentration methods by studying the mineral processing, their principal techniques, machines and the common physical techniques.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Materials Extraction Technology MAE113
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 1st Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of materials extraction technology which enables students to focus on the study of raw materials, sources of minerals in nature and mineral processing. These principals allow the students to be in complete knowledge about the extraction techniques and selecting the suitable methods for extraction.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.
D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Minerals, Sources of minerals in nature, Deposits and ore,Grade of minerals, minerals processing	Introduction to minerals	theoretical	Questions, discussion and home work
Second	3	Removal of harmful materials, Ore Transportation, Ore storage ,Feeding ,sampling	Ore preparation	theoretical	Questions, discussio and quiz
Third	3	Energy consumed in comminution, Crushing, primary crushers, secondary crushers	Comminution	theoretical	Questions, discussion and home work
Fourth	3	Types of mills, motion of charge	Grinding	Theoretical + tutorial	Questions, discussion and quiz
Five	3	Screening performance, screen types, screening surfaces	Industrial screening	Theoretical	Questions, discussion and home work
Sixth	3	Principles of classification ,Types of classifiers,	Classification	Theoretical + tutorial	Questions, discussion and home work
Seventh	3	Principal of process , Dense medium types, separating vessels	Dense medium separation	Theoretical +	Questions, discussion and home work
Eighth	3	Principles of flotation ,collectors, forthers, regulators	Forth flotation	Theoretical +	Questions, discussion and quiz
Ninth	3	Magnetism in minerals, types of magnetic separator	Magnetic separation	Theoretical + tutorial	Questions, discussion and home work
Tenth	3	Principles of separation , types of electrical separators	Electrical separation	Theoretical + tutorial	Questions, discussion and home work
Eleventh	3	Sintering ,pelletizing,	Agglomeration	Theoretical + tutorial	Questions, discussion and home work
Twelfth	3	Removal of solid particles from gases, cyclone classifier , multi cyclones classifiers	Environmental influence	Theoretical + tutorial	Questions, discussion and home work
Thirteenth	3	Roasting, sulfurization, carborization	Thermal method	Theoretical + tutorial	Questions, discussion and quiz

Fourteenth	3	Electrolytic refining, metallurgical water methods	Oxide ores extraction	Theoretical + tutorial	Questions, discussion and home work
Fifteenth	3	Tailings dams, reprocessing and reuse of tailings , sub-marina disposal	Tailings disposal	Theoretical + tutorial	Questions, discussion and home work

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of materials extraction methods necessary to explain the chemical and thermal methods of ferrous and non-ferrous metals extraction methods by studying their extractive metallurgy, refining and production processes using the common methods.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Materials Extraction Technology MAE123

4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 1st Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	

8. Aims of the Course

The objective of this course is to introduce students to fundamental area of materials extraction methods which enables students to focus on the study of the thermal and chemical processes for ferrous and non-ferrous metals extraction, and their refining and production processes. These principals allow the students to be in complete knowledge about production methods which use to producing most of metals and knowing some of their properties and applications.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
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4- Laboratories.
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1- Short exams (Quiz).
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C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

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C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Ferrous metals, non ferrous metals, periodic table, nature and location of steel making	Introduction to ferrous and non ferrous metals extraction	theoretical	Questions, discussion and home work
Second	3	Principal operation stage , Iron ore, ore preparation , coal, fluxes, Air supply	Ferrous extractive metallurgy	theoretical	Questions, discussion and quiz
Third	3	Blast furnace methods, Blowing ,Reduction, Tapping	Iron Production (Iron Reduction)	theoretical	Questions, discussion and home work
Fourth	3	Chemical reactions, Slag formation, Product and by-products of blast	Blast furnace reaction	Theoretical + tutorial	Questions, discussion and quiz

		furnace			
Five	3	Alternative methods , Direct reduction methods , Smelting Reduction methods	Alternative iron making methods	Theoretical	Questions, discussion and home work
Sixth	3	Manufacture of cast iron , cupola furnace , Types of cast iron	Cast iron production	Theoretical + tutorial	Questions, discussion and home work
Seventh	3	Raw materials , source of metallic iron,Steel production methods , Special steel	Steel production (Refining process)	Theoretical +	Questions, discussion and home work
Eighth	3	Sources of ore, Extraction of copper ,concentration , roasting , smelting , converting , refining	Copper production	Theoretical +	Questions, discussion and quiz
Ninth	3	Sources of ore, Extraction of aluminum, Bayer process, Hall-Heroult process, Refining , Properties , Application	Aluminum production	Theoretical + tutorial	Questions, discussion and home work
Tenth	3	Sources of ore, extraction of nickel, concentration , roasting, converting, refining, properties , application	Nickel production	Theoretical + tutorial	Questions, discussion and home work
Eleventh	3	Sources , extraction of zinc , pyrometallurgy process , roasting retorts, properties , application	Zinc production	Theoretical + tutorial	Questions, discussion and home work
Twelfth	3	Sources , extraction of magnesium , properties, application	Magnesium production	Theoretical + tutorial	Questions, discussion and home work
Thirteenth	3	Souces , extraction of silver , properties application	Silver production	Theoretical + tutorial	Questions, discussion and quiz
Fourteenth	3	Sources , extraction of gold , properties, application	Gold production	Theoretical + tutorial	Questions, discussion and home work
Fifteenth	3	Sources, extraction of uranium ,high purity uranium metal, properties, application	Uranium production	Theoretical + tutorial	Questions, discussion and home work

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	

A- Recommended books and references (scientific journals, reports ,....	1)Basic concepts of Iron and Steel Making , by Sujay Kumar Dutta. Yakshil B.Chokshi 2)Extraction of Nuclear and Non-ferrous Metals by Sujay Kumar Dutta. Dharmesh R. Lodhari.
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of materials science necessary to explain and solve engineering problems by identifying and diagnosing defects and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the crystal structure of engineering materials and phase charts.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Principles of Computer Science code: U116
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st. Semester/ 1st Year
6. Number of hours tuition (total)	60 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The theoretical foundations of material engineering have expanded substantially in recent years. The objective of this course is to introduce students to this fundamental area of computer science which enables students to focus on the study of programming languages. These languages allow the students to assess what could be achieved through computing	

when they are using it to solve problems in science and engineering. The course exposes students to the programming with word, excel, as well as to its usage for problem solving. The course introduces basic programming instructions and their properties, and the necessary mathematical libraries to develop different software applications. Upon completion of this course the students are expected to become proficient in key topics of word, excel programming, and to have the opportunity to explore the current topics in this area.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

Week	Hours	ILOs	Teaching Method	Assessment Method
First	4	Principles of Computer Science Introduction to Computer, Important processes, Data	Theoretical + tutorial	Questions and discussion
Second	4	Main Computer Parts Hardware, Software, System Programs	Theoretical + tutorial	Questions and discussion
Third	4	Types of programming language	Theoretical + tutorial	Questions and discussion
Fourth	4	Explore Window, Backstage View, Entering Text, Microsoft, Move Around in Word Save Document, Opening a Document in Word 2010	Theoretical + tutorial	Questions and discussion
Five	4	Closing a Document, Context Help Insert Text, Select Text, Delete Text, Copy & Paste Find & Replace, Spell Check in Word 2010	Theoretical + tutorial	Questions and discussion
Sixth	4	Zoom In-Out, Special Symbols, Undo Changes Setting Text Fonts, Text Change Text Case Decoration, Change Text Color, Text Alignments, Indent Paragraphs	Theoretical + tutorial	Questions and discussion
Seventh	4	Create Bullets, Set Line Spacing, Borders and Shades, Header and Footer, Add Page	Theoretical + tutorial	Questions and discussion

		Numbers, create a Table, Rows & Columns, Merging Cells		
Eighth	4	Introduction to Excel, Range, Range Examples, Fill a Range, Move a Range, Copy/Paste a Range	Theoretical + tutorial	Questions and discussion
Ninth	4	Insert Row, Column, Formulas and Functions, Enter a Formula in Excel	Theoretical + tutorial	Questions and discussion
Tenth	4	Operator Precedence Copy/Paste a Formula Insert a Function in Excel	Theoretical + tutorial	Questions and discussion
Eleventh	4	Subtract, Multiply, Divide, Square Root, Percentage in Excel	Theoretical + tutorial	Questions and discussion
Twelfth	4	Microsoft PowerPoint The Ribbon, The Design Tab, How to Add Content, How to Choose a Theme and Style .	Theoretical + tutorial	Questions and discussion
Thirteenth	4	How to Power up PowerPoint, Add PowerPoint Object Animations, Sequence Object Animations in PowerPoint, Add PowerPoint Slide Transitions.	Theoretical + tutorial	Questions and discussion
Fourteenth	4	Flowcharts and Algorithms, Introduction, Symbols and Idiomatic Forms in Flowcharts, Algorithms (Pseudo Code), Examples of Algorithm, Type of Algorithms.	Theoretical + tutorial	Questions and discussion
Fifteenth	4	Importance of Using Flowcharts, Flowcharts Types, Simple Sequential Flowcharts, Branched Flowcharts, Simple-Loop Flowcharts, Multi-Loop Flowcharts, The Idiomatic Form for Counters, Exercises	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	تعلم الحاسب الشخصي تأليف د. حسن هادي الزيادي د. احمد حسن علي
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of materials science necessary to explain and solve engineering problems by identifying and diagnosing defects and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the material technology and manufacturing technology.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Electrical Engineering Material MAE114
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 1st Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	
8. Aims of the Course	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.
D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Thevenins Therom, How to Thevenize a given circuit	D.C Networking Theorems	theoretical ,Expremant	Questions and discussion
Second	2	Thevenins Therom, general instructions for finding Thevenin Equivalent Circuit	D.C Networking Theorems	theoretical	Questions and discussion
Third	2	Nortan Therom, How to Nortanize a given circuit	D.C Networking Theorems	theoretical ,Expremant	Questions and discussion
Fourth	2	Nortan Therom,, general instructions for finding Norton Equivalent Circuit	D.C Networking Theorems	theoretical	Questions and discussion
Five	2	Indepandent and depandent sources	D.C Networking Theorems	theoretical and Experimant	Questions and discussion
Sixth	2	.Maximam power transfer therom	D.C Networking Theorems	theoretical Experimant	Questions and discussion
Seventh	2	Generating of Electric Voltage and Current	A.C Fundemantal	theoretical	Questions and discussion
Eighth	2	Alternat method for Equation of the Alternating Voltages and Currents Simple waves Complex waveform ,Time Period Frequncy Amplitude	A.C Fundemantal	theoretical	Questions and discussion
Ninth	2	Defferent forms of E.M.F Equations ,Examples	A.C Fundemantal	theoretical	Questions and discussion
Tenth	2	A.C through Resistance and Inductance ,	Series A.C Circuits	theoretical	Questions and discussion
Eleventh	2	Power Factor ,Active ,Reactive and Apperent Power	Series A.C Circuits	theoretical	Questions and discussion
Twelfth	2	A.C Throw Resistance and Capacitance	Series A.C Circuits	theoretical and Experiment	Questions and discussion
Thirteenth	2	A.C throw Resistance and Inductace and Capacitance	Series A.C Circuits	theoretical and Experiment	Questions and discussion
Fourteenth	2	Resonce in R-L-C circuits , Grafical representation of Resonce Resonce Curve	Series A.C Circuits	theoretical and Experiment	Questions and discussion

Fifteenth	2	Half Power Bandwith of a resont circuit , Bandwith B at any off Resonce Frequncy		theoretical and Experiment	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	Basic Electrical Engineering Technology First edition, John Wiley and Sons, Phillip F volume 1 : basic electrical engineering. By Theraja2010 Electrical Engineering Materials by Adrianus J. Dekker Authors: Adrianus J. Dekker Edition: 1st Pages: 220
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides studying the basics of engineering mechanics /dynamic, Newtons laws , work and energy , Impulse and Momentum, and the ability to use this knowledge in different engineering applications.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Engineering Mechanics /dynamic/ MAE122
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 1st Year
6. Number of hours tuition (total)	60 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The aim of studying Engineering mechanics which includes the basics of static and dynamic to provide the student with knowledge and ability to solve different engineering problems.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
B. Subject-specific skills B1. The ability to select engineering materials for scientific and industrial applications. B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them. B3. Writing scientific reports, reading blueprints and analyzing engineering materials. B4. The ability to keep pace with developments in engineering materials and their properties.
Teaching and Learning Methods
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories. 5- Graduation projects. 6- Scientific visits. 7- Seminars held in the department.

8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	4	Introduction	Engineering Mechanics-Dynamic	theoretical	Questions and discussion
Second	4	Kinematics-Rectilinear motion	Engineering Mechanics-Dynamic	theoretical	Questions and discussion
Third	4	Kinematics-Erratic motion	Engineering Mechanics-Dynamic	theoretical	Questions and discussion

Fourth	4	Kinematics-Projectile motion	Engineering Mechanics-Dynamic	Theoretical + tutorial	Questions and discussion
Five	4	Kinematics-Curvilinear motion	Engineering Mechanics-Dynamic	Theoretical	Questions and discussion
Sixth	4	(Rectangular components)	Engineering Mechanics-Dynamic	Theoretical + tutorial	Questions and discussion
Seventh	4	Kinematics-curvilinear motion	Engineering Mechanics-Dynamic	Theoretical +	Questions and discussion
Eighth	4	(normal and tangential components)	Engineering Mechanics-Dynamic	Theoretical +	Questions and discussion
Ninth	4	Absolute dependent motion	Engineering Mechanics-Dynamic	Theoretical + tutorial	Questions and discussion
Tenth	4	Relative motion	Engineering Mechanics-Dynamic	Theoretical + tutorial	Questions and discussion
Eleventh	4	Discussion and solution of home works	Engineering Mechanics-Dynamic	Theoretical + tutorial	Questions and discussion
Twelfth	4	Kinetic-Force, mass, acceleration (rectilinear motion	Engineering Mechanics-Dynamic	Theoretical + tutorial	Questions and discussion
Thirteenth	4	Kinetics Force, mass, acceleration (curvilinear motion)	Engineering Mechanics-Dynamic	Theoretical + tutorial	Questions and discussion
Fourteenth	4	Work and energy	Engineering Mechanics-Dynamic	Theoretical + tutorial	Questions and discussion
Fifteenth	4	Impulse and momentum	Engineering Mechanics-Dynamic	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	1. J. L. Meriam and L. G. Kraige, 'Engineering Mechanics: dynamic (V.1), 7th edition, Wiley 2012. 2. 2.R.C. Hibbeler, Engineering Mechanics: dynamic (Thirteenth Edition), Prentice Hall 2004
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	J. L. Meriam and L. G. Kraige, 'Engineering Mechanics: Statics (V.1), 7th edition, Wiley 2012.
B- Electronic references, websites	

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides studying the basics of engineering mechanics /static, Force Systems, Force Components, Resultant. Moment, Couple, Equilibrium, Centroid .

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Engineering Mechanics /static MAE112
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 1st Year
6. Number of hours tuition (total)	60 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The aim of studying Engineering mechanics which includes the basics of static and dynamic to provide the student with knowledge and ability to solve different engineering problems.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
B. Subject-specific skills B1. The ability to select engineering materials for scientific and industrial applications. B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	4	Introduction	Engineering Mechanics-Static	theoretical	Questions and discussion
Second	4	Force system and components	Engineering Mechanics-Static	theoretical	Questions and discussion
Third	4	Resultant (analytic method)	Engineering Mechanics-Static	theoretical	Questions and discussion
Fourth	4	Resultant (parallelogram method)	Engineering Mechanics-Static	Theoretical + tutorial	Questions and discussion
Five	4	Moment	Engineering Mechanics-Static	Theoretical	Questions and discussion
Sixth	4	Couple	Engineering Mechanics-Static	Theoretical + tutorial	Questions and discussion
Seventh	4	Equilibrium	Engineering Mechanics-Static	Theoretical +	Questions and discussion
Eighth	4	Centroid	Engineering Mechanics-Static	Theoretical +	Questions and discussion
Ninth	4	Discussion and solution of home works	Engineering Mechanics-Static	Theoretical + tutorial	Questions and discussion
Tenth	4	Moment of inertia	Engineering Mechanics-Static	Theoretical + tutorial	Questions and discussion
Eleventh	4	Friction	Engineering Mechanics-Static	Theoretical + tutorial	Questions and discussion
Twelfth	4	Structures	Engineering Mechanics-Static	Theoretical + tutorial	Questions and discussion
Thirteenth	4	Frame and machine	Engineering Mechanics-Static	Theoretical + tutorial	Questions and discussion
Fourteenth	4	Quiz	Engineering Mechanics-Static	Theoretical + tutorial	Questions and discussion
Fifteenth	4	Discussion	Engineering Mechanics-Static	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	1. J. L. Meriam and L. G. Kraige, 'Engineering Mechanics: Statics (V.1), 7th edition, Wiley 2012. 2. 2.R.C. Hibbeler, Engineering Mechanics: STATICS (Thirteenth Edition), Prentice Hall 2004
2. Key references (sources)	

A- Recommended books and references (scientific journals, reports ,....	J. L. Meriam and L. G. Kraige, 'Engineering Mechanics: Statics (V.1), 7th edition, Wiley 2012.
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides the possibility of solving the problem and the question in a programmatic manner, depending on the tools that represent an important part of the used programming language, which is VB.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	VB Programming U126
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 1st Year
6. Number of hours tuition (total)	60 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The theoretical foundations of computer engineering have expanded substantially in recent years. The objective of this course is to introduce students to this fundamental area of computer science which enables students to focus on the study of programming languages. These languages allow the students to assess what could be achieved through computing when they are using it to solve problems in science and engineering. The course exposes students to the programming with VB, as well as to its usage for problem solving. The course introduces basic programming instructions and their properties, and the necessary	

mathematical libraries to develop different software applications. Upon completion of this course the students are expected to become proficient in key topics of VB programming, and to have the opportunity to explore the current topics in this area.

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice by using VB.
B. Subject-specific skills B1. The ability to apply the programming for scientific and industrial applications. B2. The ability to think about solving problems by using VB programming . B3. The ability to keep pace with developments in computer programming and their applications.
Teaching and Learning Methods
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories. 5- Graduation projects. 6- Scientific visits. 7- Seminars held in the department. 8- Summer training.
Assessment methods
1- Short exams (Quiz). 2- Homework. 3- Semester and final exams for theoretical and practical subjects. 4- Small projects within the lesson. 5- Interaction within the lecture. 6- Reports.
C. Thinking Skills C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall C2. Response: Follow up the student's interaction with the material displayed on the screen C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	4	Variables, data types, operations	Introduction to programming	theoretical	Questions and discussion
Second	4	Paradigms: functional, procedural, object oriented	Introduction to programming	theoretical	Questions and discussion
Third	4	Strategies, process, implementation, debugging	Problem-solving algorithms	theoretical	Questions and discussion
Fourth	4	Concepts of algorithms, structured decomposition	Problem-solving algorithms	theoretical	Questions and discussion
Five	4	Syntax & semantics, variables, types, expressions, math functions	Programming in VB	theoretical	Questions and discussion
Sixth	4	Logical operations, I/O, functions, encapsulation, hiding,	Programming in VB	theoretical	Questions and discussion
Seventh	4	Conditional, iterative, control structure	Control structures	theoretical	Questions and discussion
Eighth	4	Loops, sequencing, selection, iteration functions	Control structures	theoretical	Questions and discussion
Ninth	4	Primitive types, arrays, strings	Basic data structures	theoretical	Questions and discussion
Tenth	4	Records, stack, heap allocation	Basic data structures	theoretical	Questions and discussion
Eleventh	4	Static structure programming	Structure programming	theoretical	Questions and discussion
Twelfth	4	Dynamic structured programming	Structure programming	theoretical	Questions and discussion
Thirteenth	4	Recursive math functions, divide and conquer strategies	Recursion	theoretical	Questions and discussion
Fourteenth	4	Recursive backtracking,	Recursion	theoretical	Questions and discussion

		implementation			
Fifteenth	4	Different topics	Discussion and revision	theoretical	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	Introduction to Programming Using Visual Basic, 11th edition by David I.
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides the possibility of solving scientific and engineering problems in a programmatic manner depending on the tools that represent an important part of the used programming language, which is MATLAB. The course allows to deal with the programming language in a high-performance manner, as its tools represent an important part of the stages of building engineering programs for different applications.

1. Teaching Institution	
2. University Department/Centre	Materials Engineering Department
3. Course title/code	Introduction to computer programming /MAE216
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 2nd Year
6. Number of hours tuition (total)	60 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to this fundamental area of computer science which enable students to focus on the study of programming language using Matlab. This language allow the students to assess what could be achieved through computing when they are using it to solve problems in science and engineering.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
B. Subject-specific skills B1. The ability to select engineering materials for scientific and industrial applications. B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them. B3. Writing scientific reports, reading blueprints and analyzing engineering materials. B4. The ability to keep pace with developments in engineering materials and their properties.
Teaching and Learning Methods
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories.
Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	4	General introduction, basic features, quick presentation on MATLAB, starting MATLAB, quitting MATLAB	Introduction	theoretical and practical	Questions and discussion
Second	4	Getting started, creating MATLAB expressions, hierarchy of arithmetic operations, entering multiple statements per line, output display format, error messages, getting help	Introduction	theoretical and practical	Questions and discussion
Third	4	Mathematical functions	Introduction	theoretical and practical	Questions, discussion and quiz

Fourth	4	Basic plotting, introduction, creating a plot, specifying line styles and colors	Plotting	theoretical and practical	Questions and discussion
Five	4	Multiple data sets in one plot, plotting multiple plots separately, create graph with two y-axes	Plotting	theoretical and practical	Questions and discussion
Sixth	4	Stair graph, histogram graph, rose graph	Plotting	theoretical and practical	Questions, discussion and quiz
Seventh	4	Pareto chart, area Graph (2D), Pie Chart	Plotting	theoretical and practical	Questions and discussion
Eighth	4	3D graphs, 3D pie chart, 3D shaded surface plot, sphere with two colors, animating plot	Plotting	theoretical and practical	Questions, discussion and quiz
Ninth	4	Introduction, loops relational and logical operators, the for loop, the while loop,	Loops and Controlling Command	theoretical and practical	Questions and discussion
Tenth	4	Controlling command, the ``if...end'' structure, return,	Loops and Controlling Command	theoretical and practical	Questions and discussion
Eleventh	4	Controlling command ,continue, break switch and case	Loops and Controlling Command	theoretical and practical	Questions, discussion and quiz
Twelfth	4	Entering a vector, entering a matrix, matrix indexing, colon operator	Matrix	theoretical and practical	Questions and discussion
Thirteenth	4	Linear spacing, colon operator in a matrix, creating a sub-matrix ,deleting row or column	Matrix	theoretical and practical	Questions and discussion
Fourteenth	4	Dimension, continuation, transposing a matrix, concatenating matrix	Matrix	theoretical and practical	Questions, discussion and quiz
Fifteenth	4	Matrix generators, matrix functions, matrix inverse, mathematics operation for matrix	Matrix	theoretical and practical	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources) ：INTRODUCTION TO MATLAB FOR ENGINEERING STUDENTS, David Houcque (version 1.2, August 2005).	
A- Recommended books and references (scientific journals,	

reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides the possibility of solving scientific and engineering problems in a programmatic manner depending on the tools that represent an important part of the used programming language, which is MATLAB. The course allows to deal with the programming language in a high-performance manner, as its tools represent an important part of the stages of building engineering programs for different applications.

1. Teaching Institution	
2. University Department/Centre	Materials Engineering Department
3. Course title/code	Computer programming /MAE226
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 2nd Year
6. Number of hours tuition (total)	60 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to this fundamental area of computer science which enable students to focus on the study of programming language using Matlab. This language allow the students to assess what could be achieved through computing when they are using it to solve problems in science and engineering.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	4	Array operations	Programming of Linear Equation	theoretical and practical	Questions and discussion
Second	4	Reshaping arrays, create 3D array, building multidimensional arrays with the cat function, permuting array dimensions	Programming of Linear Equation	theoretical and practical	Questions and discussion
Third	4	Rotating matrices and arrays	Programming of Linear Equation	theoretical and practical	Questions, discussion and quiz
Fourth	4	Solving linear equations	Programming of Linear Equation	theoretical and practical	Questions and discussion
Five	4	Differentiating and integrating symbolic expressions	Programming of Linear Equation	theoretical and practical	Questions and discussion
Sixth	4	Introduction, M-File Scripts	Programming in MATLAB (M-File)	theoretical and practical	Questions and discussion
Seventh	4	M-File functions	Programming in MATLAB (M-File)	theoretical and practical	Questions, discussion and quiz
Eighth	4	Input and output to a script file	Programming in MATLAB (M-File)	theoretical and practical	Questions and discussion
Ninth	4	Input and output to a function file, output commands	Programming in MATLAB (M-File)	theoretical and practical	Questions, discussion and quiz
Tenth	4	Introduction, debugging process, preparing for debugging, setting breakpoints	Debugging M-File	theoretical and practical	Questions and discussion
Eleventh	4	Find and fix a problem, ending debugging	Debugging M-File	theoretical and practical	Questions, discussion and quiz
Twelfth	4	Introduction, getting Started	GUI (Graphical User Interface)	theoretical and practical	Questions and discussion

Thirteenth	4	How to create GUIs with MATLAB, add the components	GUI (Graphical User Interface)	theoretical and practical	Questions and discussion
Fourteenth	4	Title and string property for components	GUI (Graphical User Interface)	theoretical and practical	Questions, discussion and quiz
Fifteenth	4	Programming the GUI, saving and running a GUI	GUI (Graphical User Interface)	theoretical and practical	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources) ：INTRODUCTION TO MATLAB FOR ENGINEERING STUDENTS, David Houcque (version 1.2, August 2005).	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides an introduction to the basic principles that are necessary to explain and solve engineering problems by identifying the types of stresses resulting from different loads.

1. Teaching Institution	

2. University Department/Centre	
3. Course title/code	Strength of Materials
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 2nd Year
6. Number of hours tuition (total)	60 hrs
7. Date of production/revision of this	

8. Aims of the Course

The objective of this materials is to provide the future engineer with the means of analyzing and designing various machines and load-bearing structures. Both the analysis and the design of a given structure involve the determination of stresses and deformations. The Deflections resulting and the stresses and strains set up within bodies , are all considered in an attempt to provide sufficient knowledge to enable any component to be designed such that it will not fail within its service.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.

7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	4	Torsion theory, Polar second moment of area, Torsional Strain energy in torsion,	Torsion	theoretical	Questions and discussion
Second	4	Shear stress and shear strain in shafts,	Torsion	theoretical	Questions and discussion
Third	4	rigidity, hollow shafts, thin-walled tubes,	Torsion	theoretical	Questions and discussion

		Composite shafts connections,			
Fourth	4	Power transmitted by shafts, Combined stress systems.	Torsion	Theoretical + tutorial	Questions and discussion
Five	4	Internal pressure, stresses,	Thin Cylinder and Shells	Theoretical	Questions and discussion
Sixth	4	‹Thin rotating ring and spherical shell, pressure Vessels	Thin Cylinder and Shells	Theoretical + tutorial	Questions and discussion
Seventh	4	Cylindrical vessel with hemispherical end,	Thin Cylinder and Shells	Theoretical +	Questions and discussion
Eighth	4	Effects of end plates and joints.	Thin Cylinder and Shells	Theoretical +	Questions and discussion
Ninth	4	Longitudinal stress, Maximum shear stress,	Thick Cylinder	Theoretical + tutorial	Questions and discussion
Tenth	4	Compound cylinders,	Thick Cylinder	Theoretical + tutorial	Questions and discussion
Eleventh	4	Shrinkage or interference allowance, Compound cylinder -different materials,	Thick Cylinder	Theoretical + tutorial	Questions and discussion
Twelfth	4	Thick cylinder - internal pressure only, Comparison with thin cylinder theory.	Thick Cylinder	Theoretical + tutorial	Questions and discussion
Thirteenth	4	Stresses on oblique planes, Material subjected to pure shear,	Complex Stresses	Theoretical + tutorial	Questions and discussion
Fourteenth	4	two mutually perpendicular direct stresses, combined stresses,	Complex Stresses	Theoretical + tutorial	Questions and discussion
Fifteenth	4	Graphical solution - Mohr 's stress circle, Three-dimensional stresses -graphical representation.	Complex Stresses	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	

B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides an introduction to the basic principles of material mechanics that are necessary to explain and solve engineering problems by identifying the types of stresses resulting from different loads.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Mechanics of Materials
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 2nd Year
6. Number of hours tuition (total)	60 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this materials is to provide the future engineer with the means of analyzing and designing various machines and load-bearing structures. Both the analysis and the design of a given structure involve the determination of stresses and deformations. The Deflections resulting and the stresses and strains set up within bodies , are all considered in an attempt to provide sufficient knowledge to enable any component to be designed such that it will not fail within its service.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend

it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	4	Types of Loads, Direct stress, Direct Strain, shear stress. Hooke's Law & Young's Modulus, Tensile Test	Simple Stress and Strain	theoretical	Questions and discussion
Second	4	Stress-Strain Diagram, Ductility, Poisson's ratio	Simple Stress and Strain	theoretical	Questions and discussion
Third	4	Shear strain, double shear stress , temperature stresses	Simple Stress and Strain	theoretical	Questions and discussion
Fourth	4	Types of beams, types of load, Beam carries Concentrated load, distributed load or	Shearing force and bending moment diagrams	Theoretical + tutorial	Questions and discussion
Five	4	Beam carries Concentrated load, and distributed load	Shearing force and bending moment diagrams	Theoretical	Questions and discussion
Sixth	4	Beam carries tringle load or non-linear load. Beam carries combined load	Shearing force and bending moment diagrams	Theoretical + tutorial	Questions and discussion
Seventh	4	Bending of composite, combined loading, Shear stresses owing to bending,	Bending Stress	Theoretical +	Questions and discussion
Eighth	4	Built-in beam carrying different load conditions, Advantages and disadvantages of built-in beams	Bending Stress	Theoretical +	Questions and discussion
Ninth	4	Strain energy in bending, .	Bending Stress	Theoretical + tutorial	Questions and discussion
Tenth	4	Direct integration method, Macaulay's method,.	Slope And Deflection	Theoretical + tutorial	Questions and discussion

Eleventh	4	Mohr's "area-moment" method, Principle of superposition,	Slope And Deflection	Theoretical + tutorial	Questions and discussion
Twelfth	4	Energy method, Maxwell's theorem	Slope And Deflection	Theoretical + tutorial	Questions and discussion
Thirteenth	4	Distribution of shear stress due to bending,	Shear Stress Distribution	Theoretical + tutorial	Questions and discussion
Fourteenth	4	Application to different sections, Vertical and horizontal shear,,	Shear Stress Distribution	Theoretical + tutorial	Questions and discussion
Fifteenth	4	Limitation of shear stress distribution theory Laser source, Electrochemical removal.	Shear Stress Distribution	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the principles of Mathematics science necessary to explain and solve engineering problems by using the best method and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the analysis of the vectors differential equations and their applications

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Mathematics II-E221
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 2nd Year
6. Number of hours tuition (total)	60 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of mathematics which enables students to focus on the study of vectors, ODEs and their applications. These principals allow the students to assess what could be achieved through this course when they are apply the mathematical model in engineering applications.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
B. Subject-specific skills B1. The ability to solve the diffential equations for scientific and industrial applications. B2. The ability to think about solving problems related to the use of mathematical model for solve the engineering problems . B3. The ability to keep pace with developments in engineering materials and their properties.
Teaching and Learning Methods
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories. 5- Graduation projects. 6- Scientific visits. 7- Seminars held in the department.

8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	4	Laplace Transform for Functions		theoretical	Questions and discussion
Second	4	Laplace Transform for Integrals		theoretical	Questions and discussion
Third	4	Laplace Transform for derivatives		theoretical	Questions and discussion
Fourth	4	Laplace Transform for unit step		Theoretical + tutorial	Questions and discussion

Five	4	Laplace Transform for delta step		Theoretical	Questions and discussion
Sixth	4	Laplace inverse		Theoretical + tutorial	Questions and discussion
Seventh	4	Laplace transform for Gamma function		Theoretical +	Questions and discussion
Eighth	4	Laplace solution of ODEs		Theoretical +	Questions and discussion
Ninth	4	Laplace solution of ODEs		Theoretical + tutorial	Questions and discussion
Tenth	4	Laplace solution of ODEs		Theoretical + tutorial	Questions and discussion
Eleventh	4	Sequences and Series		Theoretical + tutorial	Questions and discussion
Twelfth	4	Convergence and divergence of series		Theoretical + tutorial	Questions and discussion
Thirteenth	4	Series test		Theoretical + tutorial	Questions and discussion
Fourteenth	4	Tayler's series		Theoretical + tutorial	Questions and discussion
Fifteenth	4	Maclaurin series		Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Advanced Engineering mathematics , 11th edition by Wylie
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the principles of Mathematics science necessary to explain and solve engineering problems by using the best method and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the analysis of the vectors differential equations and their applications

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Mathematics I-E210
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 2nd Year
6. Number of hours tuition (total)	60 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of mathematics which enables students to focus on the study of vectors, ODEs and their applications. These principals allow the students to assess what could be achieved through this course when they are apply the mathematical model in engineering applications.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to solve the diffential equations for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of mathematical model for solve the engineering problems .

B3. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories. 5- Graduation projects. 6- Scientific visits. 7- Seminars held in the department. 8- Summer training.
Assessment methods
1- Short exams (Quiz). 2- Homework. 3- Semester and final exams for theoretical and practical subjects. 4- Small projects within the lesson. 5- Interaction within the lecture. 6- Reports.
C. Thinking Skills C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall C2. Response: Follow up the student's interaction with the material displayed on the screen C3. Attention: Follow up on the interest of the student who interacted the most with the presented material. C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it. C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.
D. General and Transferable Skills (other skills relevant to employability and personal development) D1. Develop the student's ability to deal with technology. D2. Developing the student's ability to deal with the Internet. D3. Developing the student's ability to deal with multiple means. D4. Develop the student's ability to dialogue and discussion.

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method

First	4	Vectors analysis		theoretical	Questions and discussion
Second	4	Vectors derivatives and Applications		theoretical	Questions and discussion
Third	4	Vectors derivatives and Applications		theoretical	Questions and discussion
Fourth	4	Vectors Integrals and applications		Theoretical + tutorial	Questions and discussion
Five	4	Vectors Integrals and applications		Theoretical	Questions and discussion
Sixth	4	Solution of Ordinary Differential Equations (ODE)		Theoretical + tutorial	Questions and discussion
Seventh	4	First Order ODEs		Theoretical +	Questions and discussion
Eighth	4	First Order ODEs		Theoretical +	Questions and discussion
Ninth	4	First Order ODEs		Theoretical + tutorial	Questions and discussion
Tenth	4	First Order ODEs		Theoretical + tutorial	Questions and discussion
Eleventh	4	Second order ODEs		Theoretical + tutorial	Questions and discussion
Twelfth	4	Second order ODEs		Theoretical + tutorial	Questions and discussion
Thirteenth	4	Second order ODEs		Theoretical + tutorial	Questions and discussion
Fourteenth	4	Second order ODEs		Theoretical + tutorial	Questions and discussion
Fifteenth	4	Second order ODEs		Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Advanced Engineering mathematics , 11th edition by Wylie
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of kinetics reaction, electrochemistry science necessary to explain and solve chemical reaction problems by identifying and diagnosing defects and the possibility of solving the problem and the issue in an engineering extraction of metals style based on chemical principles where the course allows to deal with the reaction time of materials and phase charts

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	CHEMICAL Metallurgy MAExxxxx
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 2nd Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of kinetics of reaction, electrochemistry, Adsorabtion **and** Nucleation **processes which enables students to focus on the study of effecting factors, physical and chemical properties of** Evaporating**, and** Transpira**ing materials ,Non-Conventional Cutting Technology. These principals allow the students to assess what could be achieved through this course when they are identifying metals reaction to solve problems in industries.**	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools

necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Introduction to Reaction kinetics , Homogeneous reaction and Rate Reaction, Rate-Controlling Step	Reaction kinetics	Theoretical	Questions and discussion
Second	2	Order of Reaction (First-order , Second-Order) , Reversible reaction , Heterogeneous Reactions in metallurgical system) and Rate Equation, Types of Reactions	Reaction kinetics	Theoretical	Questions and discussion
Third	2	Heat and Mass Transfer (Conduction, Convection and Radiation) , Mass Transport in Heterogeneous Reactions and Diffusions (Diffusion in the solid state) and Kirkendall Effect	Reaction kinetics	Theoretical	Questions and discussion and quiz
Fourth	2	Introduction to Electrochemistry or Electrometallurgy and Electrolytes (Classification of Electrolytes) and Electrodes	Electrochemistry	Theoretical + tutorial	Questions and discussion
Five	2	Conduction in electrolytes , Example of Electrolysis and Arrhenius Concept (Ionic Mobilities)	Electrochemistry	Theoretical	Questions and discussion
Sixth	2	Reduction and oxidation potentials: the standard potentials , Cell Types, Cell Design Optimization, Cell Operation and The effects of polarization :decomposition voltage discharge potential	Electrochemistry	Theoretical + tutorial	Questions and discussion
Seventh	2	Electrowinning and Electrorefining	Electrochemistry	Theoretical +	Questions and discussion

Eighth	2	Introduction to Interfacial Phenomena and Surface energy	Interfacial Phenomena	Theoretical +	Questions and discussion
Ninth	2	Surface tension and Interfacial energy of the other gas/liquid interface: the three phase interface,	Interfacial Phenomena	Theoretical + tutorial	Questions and discussion
Tenth	2	Adsorabtion and Adsorption Process, Adsorbent Material,	Adsorabtion	Theoretical + tutorial	Questions and discussion
Eleventh	2	Adsorption Isotherms, Langmuir , Adsorption Isotherm, Freundlich, andAdsorption Potential	Adsorabtion	Theoretical + tutorial	Questions and discussion
Twelfth	2	The spinodal region, and Experiments on the nucleation of crystals	Nucleation	Theoretical + tutorial	Questions and discussion
Thirteenth	2	Evaporation, Transpiration, and Sublimation	Nucleation	Theoretical + tutorial	Questions and discussion
Fourteenth	2	Energy Balance Method	Evaporation	Theoretical + tutorial	Questions and discussion
Fifteenth	2	Aerodynamic method, Combined method	Non-Conventional Cutting Technology	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Problem in Metallurgical thermodynamics and Kinetics: by DUBE
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	An introduction to chemical Metallurgy : by R.H. Parker
B- Electronic references, websites	https://www.doitpoms.ac.uk/tlplib/ellingham_diagrams/interactive.php

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of draw the mechanical parts and enhanced the ability to read and discuss the drawings. Give acknowledge for mechanical drawings, Study the STANDARDS for drawings of mechanical parts, Study and draw the assembly parts.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Mechanical Drawing
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 2nd Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of mechanical drawings which enables students to focus on the study of design and map readings of mechanical parts in engines. These principals allow the students to assess what could be achieved through this course when they are identifying these machine parts	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulates, and solves engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.
D3. Developing the student's ability to deal with multiple means.
D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Review on projection views	Engineering Drawings	Theoretical + tutorial	Questions and discussion
Second	3	Review on sectional views	Engineering Drawings	Theoretical + tutorial	Questions and discussion
Third	3	Screwed fasteners	Screw Fasteners	Theoretical + tutorial	Questions and discussion
Fourth	3	Screwed fasteners	Screw Fasteners	Theoretical + tutorial	Questions and discussion
Five	3	Keys, cotters and pin joints	Screw Fasteners	Theoretical + tutorial	Questions and discussion
Sixth	3	Keys, cotters and pin joints	Screw Fasteners	Theoretical + tutorial	Questions and discussion
Seventh	3	Shaft coupling	Screw Fasteners	Theoretical + tutorial	Questions and discussion
Eighth	3	Shaft coupling	Screw Fasteners	Theoretical + tutorial	Questions and discussion
Ninth	3	Revit joints	Screw Fasteners	Theoretical + tutorial	Questions and discussion
Tenth	3	Revit joints	Screw Fasteners	Theoretical + tutorial	Questions and discussion
Eleventh	3	Tolerances and clearances	Tolerances	Theoretical + tutorial	Questions and discussion
Twelfth	3	Tolerances and clearances	Tolerances	Theoretical + tutorial	Questions and discussion
Thirteenth	3	Weld joints	Joints	Theoretical + tutorial	Questions and discussion
Fourteenth	3	Weld joints	Joints	Theoretical + tutorial	Questions and discussion
Fifteenth	3	Surface roughness	roughness	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Machine Drawings N. D. Bhatt
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	Mechanical Drawings Frank R. Kepler
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of thermodynamic laws necessary to explain and solve thermodynamic metallurgy by identifying and diagnosing reaction materials and the possibility of solving the problem and the issue in an engineering style based on thermochemistry principles where the course allows to deal with the reaction of metals and of engineering materials and phase charts.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Metallurgical thermodynamic/ XXXX
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 2nd Year
6. Number of hours tuition (total)	30 hrs

7. Date of production/revision of this	

8. Aims of the Course

The objective of this course is to introduce students to fundamental area of thermochemisty which enables students to focus on the study of extraction and production effecting factors, physical and chemical properties of ores, and calculation of energy needs . These principals allow the students to assess what could be achieved through this course when they are identifying failure of metals production and solve problems in industries.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.

6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Introduction to Thermodynamics and Zeroeth Law of Thermodynamics,	introduction of Metallurgical thermodynamic	theoretical	Questions and discussion
Second	2	The First Law of Thermodynamics and Thermodynamically Reversible Changes	First Law of Thermodynamics	theoretical	Questions and discussion
Third	2	Gas Expansion: Maximum Work,	First Law of Thermodynamics	theoretical	Questions and discussion and quiz
Fourth	2	Heat Capacity: The Temperature-dependence of Enthalpy Changes and Thermo-chemistry and its Applications in Metallurgy,	First Law of Thermodynamics	Theoretical + tutorial	Questions and discussion
Five	2	Introduction to Second Lawand . Entropy, Free	Second Law of	Theoretical	Questions and discussion

		energy and chemical equilibriu	Thermodynamics		
Sixth	2	Some thermodynamic relationships involving entropy and Some thermodynamic relationships involving free energy	Second Law of Thermodynamics	Theoretical + tutorial	Questions and discussion
Seventh	2	Chemical equilibrium: the equilibrium constant and Controlled atmospheres	Second Law of Thermodynamics	Theoretical +	Questions and discussion
Eighth	2	The equilibrium constant and the stability of compounds Ellingham Diagrams	Second Law of Thermodynamics	Theoretical +	Questions and discussion
Ninth	2	Introduction to solutions and Ideal solutions: Raoults law	Solutions	Theoretical + tutorial	Questions and discussion
Tenth	2	Deviations from Raoults law and Activities and Activity Coefficient	Solutions	Theoretical + tutorial	Questions and discussion
Eleventh	2	Henry's Law and Sievert's Law 3.6 Regular solutions	Solutions	Theoretical + tutorial	Questions and discussion and quiz
Twelfth	2	Free energy of mixing and The Gibbs- Duhem equation	Solutions	Theoretical + tutorial	Questions and discussion
Thirteenth	2	Phase Equilbria and The Thermodynamic Phase Equation	Phase Equilbria	Theoretical + tutorial	Questions and discussion and quiz
Fourteenth	2	The Phase Rule and Phase diagrams	Phase Equilbria	Theoretical + tutorial	Questions and discussion
Fifteenth	2	Unary Systems, Binary Systems and Ternary Systems	Phase Equilbria	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Problem in Metallurgical thermodynamics and Kinetics: by DUBE
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	An introduction to chemical Metallurgy : by R.H. Parker
B- Electronic	https://www.doitpoms.ac.uk/tlplib/ellingham_diagrams/interactive.p

references, websites	hp

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The objective of this course is to give the students the ability of understanding the structure and properties of ceramic materials that qualify them designing and selection of these materials in different technological products.

1. Teaching Institution	University of Basrah
2. University Department/Centre	Department of Materials Engineering
3. Course title/code	Ceramic Materials **MAE 315**
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 3rd Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	
8. Aims of the Course	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. The principle knowledge of ceramic materials.

A2. Understanding the accurate details of structure and properties.

A3. Learning the principle techniques of manufacturing.

B. Subject-specific skills

B1. The ability to deal with ceramic materials.

B2. The ability to prepare of ceramic mixtures, forming and sintering.

B3. Writing scientific reports.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.
D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Introduction to Ceramic		theoretical	Questions and discussion
Second	2	Elementary Crystallography		theoretical	Questions and discussion
Third	2	Ceramic Crystal Structure		theoretical	Questions and discussion
Fourth	2	Traditional and Advanced Ceramics		Theoretical + tutorial	Questions and discussion
Five	2	Manufacturing Processes of Ceramics		Theoretical	Questions and discussion
Sixth	2	Manufacturing Processes of Ceramics		Theoretical + tutorial	Questions and discussion
Seventh	2	Thermodynamic of Sintering		Theoretical +	Questions and discussion
Eighth	2	Solid State of Sintering		Theoretical +	Questions and discussion
Ninth	2	Liquid state of Sintering		Theoretical + tutorial	Questions and discussion
Tenth	2	Sintering Mechanisms		Theoretical + tutorial	Questions and discussion
Eleventh	2	Refractories		Theoretical + tutorial	Questions and discussion
Twelfth	2	Structural Ceramics		Theoretical + tutorial	Questions and discussion
Thirteenth	2	Bioceramics		Theoretical + tutorial	Questions and discussion
Fourteenth	2	Alumina Ceramics		Theoretical + tutorial	Questions and discussion
Fifteenth	2	Zerconia Ceramics		Theoretical + tutorial	Questions and discussion

12. Infrastructure

1- Required reading:	

· Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	Ceramic Materials, Science and Engineering C. B. Carter and M. G. Norton
B- Electronic references, websites https://materialsproject.org/	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This course covers the topics of heat transfer by conduction at an appropriate level for undergraduate students. In this course, the student will learn how to calculate the rate of heat transfer by conduction in solid bodies, formulat mathematical models for conduction heat transfer, and even reach the final formula used in solving heat conduction problems and for different coordinates, in addition to some practical applications in which conduction transfer occurs.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Conduction Heat Transfer/ MAE317
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 3rd Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	
8. Aims of the Course	

The objective of studying heat transfer by conduction is to indentify the most important methods of heat transfer. Also, learn about the diffusion equation in heat transfer and derive its mathmatical model. This course amis to learn how to calculate the rate of heat transfer by conduction through solid bodies for different shapes and coordinates. The calculation of the rate of heat transfer through extended surfaces (fins) and for different types will also be introduced with knowlege of how to evalute the performance of the fins.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the

application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Heat transfer methods	Introduction	Theoretical	Questions and discussion
Second	3	Conduction heat transfer	Introduction	Theoretical	Questions and discussion
Third	3	Initial and boundary conditions, Heat diffusion equation in different coordinates	Heat conduction	Theoretical + tutorial	Questions and discussion
Fourth	3	Temperature distribution through plane and composite walls	Heat conduction	Theoretical	Questions and discussion
Five	3	Insulation systems	Heat conduction	Theoretical	Questions and discussion
Sixth	3	Thermal and contact resistance	Heat conduction	Theoretical + tutorial	Questions and discussion
Seventh	3	Temperature distribution in radial systems	Heat conduction	Theoretical	Questions and discussion
Eighth	3	Temperature distribution in sphere systems	Heat conduction	Theoretical	Questions and discussion
Ninth	3	Extended surface (Fins)	Heat conduction	Theoretical	Questions and discussion
Tenth	3	Study the performance of fins	Heat conduction	Theoretical + tutorial	Questions and discussion
Eleventh	3	Determination of heat transfer rate	Heat conduction	Theoretical	Questions and discussion

Twelfth	3	The energy balance method	Heat conduction	Theoretical	Questions and discussion
Thirteenth	3	The finite difference solutions	Heat conduction	Theoretical + tutorial	Questions and discussion
Fourteenth	3	Lumped capacitance method in transient heat conduction	Transient heat conduction	Theoretical	Questions and discussion
Fifteenth	3	Lumped capacitance method in transient heat conduction	Transient heat conduction	Theoretical+tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	Fundamentals of Heat and Mass Transfer,by Frank P. Incropera and David P. DeWitt,2002
B- Electronic references, websites	Reputable websites . Libraries sites in some scientific universities.

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This course covers the topics related to forced and natural convction heat transfer for undergraduate level students. In this course, the student will learn how to calculate the convection heat transfer rate for the external and internal flow using mathematical equations derived for this purpose. This course will also cover the calculation of heat exchangers of all kinds and learn how to evaluate their performance and their most important uses.

1. Teaching Institution	
2. University Department/Centre	

3. Course title/code	Convection Heat Transfer/ MAE327
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 3rd Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	

8. Aims of the Course

The objective of studying heat transfer by convection is to teach the undergraduate student to indentify this type of heat transfer methods and its most important types and the mathematical equations for each type and how to calculate the heat transfer rate for internal and external flow. The course also aims to calculate the rate of heat transfer by free convection and forced convection and to use the most important mathematical equations in these two types. This course also aims to indentify the types of heat exchangers and how to evalute their performance and to calculate heat transfer rates in these types of heat exchanger.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.

8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Convection boundary layers, velocity boundary layer, thermal boundary layer	Convection Heat Transfer	Theoretical	Questions and discussion
Second	3	Laminar and turbulent flow, convection transfer equation, Reynolds, Prandtl and Grashof	Convection Heat Transfer	Theoretical	Questions and discussion

		numbers			
Third	3	External flow, empirical correlations	Heat Transfer in Pipes	Theoretical + tutorial	Questions and discussion
Fourth	3	Flat plate in parallel flow, mixed boundary layer	Heat Transfer in Pipes	Theoretical	Questions and discussion
Five	3	Cylinder in cross flow, the sphere	Heat Transfer in Pipes	Theoretical	Questions and discussion
Sixth	3	Flow across banks of tubes, flow conditions	Heat Transfer in Pipes	Theoretical + tutorial	Questions and discussion
Seventh	3	Fully developed region, laminar flow in circular tubes.	Heat Transfer in Pipes	Theoretical	Questions and discussion
Eighth	3	Turbulent flow in circular tubes, noncircular tubes	Heat Transfer in Pipes	Theoretical	Questions and discussion
Ninth	3	Govering equations, Laminar and turbulent on surface	Free Convection	Theoretical	Questions and discussion
Tenth	3	Effects of turbulence, Empirical correlations	Free Convection	Theoretical + tutorial	Questions and discussion
Eleventh	3	Rectangular cavities, concentric cylinder, concentric sphere	Free Convection	Theoretical	Questions and discussion
Twelveth	3	Combined free and forced convection	Free Convection	Theoretical	Questions and discussion
Thirteenth	3	Overall heat exchanger coefficient , heat exchanger analysis	Heat Exchangers	Theoretical + tutorial	Questions and discussion
Fourteenth	3	Overall heat exchanger coefficient , heat exchanger analysis	Heat Exchangers	Theoretical	Questions and discussion
Fifteenth	3	The effectiveness-NTU type	Heat Exchangers	Theoretical+tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	Fundamentals of Heat and Mass Transfer,by Frank P. Incropera and David P. DeWitt,2002
B- Electronic references, websites	Reputable websites . Libraries sites in some scientific universities.

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides the students total understanding to the electrochemical explanation of metals corrosion which named the modern theory of corrosion which contains the simulation of different cases of corrosion by building up of electrochemical cells and measuring of corrosion rate.

1. Teaching Institution	University of Basrah
2. University Department/Centre	Department of Materials Engineering
3. Course title/code	Corrosion II **MAE 326**
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 3rd Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	2021
8. Aims of the Course	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. Give the students the principle understanding of corrosion problem. A2. The accurate details of the electrochemical model of corrosion. A3. Understanding the experimental models of electrochemical cells which represents corrosion cases.
B. Subject-specific skills B1. The ability to building up the experimental models. B2. The ability to predict the behavior and rate of corrosion using these models.

B3. Writing scientific reports.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Modern Theory Principles		Theoretical + tutorial	Questions and discussion
Second	3	Cell Potential and emf Serious		Theoretical + tutorial	Questions and discussion
Third	3	Polarization		Theoretical + tutorial	Questions and discussion
Fourth	3	Activation Polarization		Theoretical + tutorial	Questions and discussion
Five	3	Concentration Polarization		Theoretical + tutorial	Questions and discussion
Sixth	3	Mixed Potential Theory		Theoretical + tutorial	Questions and discussion
Seventh	3	Passivity		Theoretical + tutorial	Questions and discussion
Eighth	3	Effect of Oxidizers		Theoretical + tutorial	Questions and discussion
Ninth	3	Velocity Effect		Theoretical + tutorial	Questions and discussion
Tenth	3	Galvanic Effect		Theoretical + tutorial	Questions and discussion
Eleventh	3	Area Effect		Theoretical + tutorial	Questions and discussion
Twelfth	3	Anodic Protection		Theoretical + tutorial	Questions and discussion
Thirteenth	3	Corrosion Rate Measurement		Theoretical + tutorial	Questions and discussion
Fourteenth	3	Tafel Extrapolation		Theoretical + tutorial	Questions and discussion
Fifteenth	3	Linear Polarization		Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources) : Corrosion Engineering M. G. Fontana	
A- Recommended books and	

references (scientific journals, reports ,....	
B- Electronic references, websites	https://www.corrosionsource.com/

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of materials science necessary to explain and solve engineering problems by identifying and diagnosing defects and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the crystal structure of engineering materials and phase charts.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Welding and cutting MAE324
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 3rd Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of welding and cutting processes which enables students to focus on the study of weldability effecting factors, physical and chemical properties of welding, and cutting tool materials ,Non-Conventional Cutting Technology. These principals allow the students to assess what could be achieved through this course when they are identifying failure of welding to solve problems in industries.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the

presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Weldability effecting factors, Physical and chemical properties of welding, Classification of welding process,	Welding	theoretical	Questions and discussion
Second	2	Condition for obtaining satisfactory welds, Welding quality and performance, Selection of welding process and filler metal,	Welding	theoretical	Questions and discussion
Third	2	Type of Arc Welding, High Frequency Resistance Welding, Solid Phase Welding, Ultrasonic Welding,	Welding	theoretical	Questions and discussion
Fourth	2	Explosive Welding, High Energy Density Welding Process, Laser Beam Welding, Electron Beam Welding, Calculation of welding Parameters,	Welding	Theoretical + tutorial	Questions and discussion
Five	2	Definition, Classification, Castable Materials, Casting Process of Metals	Primary Shaping	Theoretical	Questions and discussion
Sixth	2	Classification, Cemented Carbide High Speed Steel, High Carbon Steel, Cast	Cutting Tool Materials	Theoretical + tutorial	Questions and discussion
Seventh	2	Nonferrous Alloy, Diamond, Ceramic, Cermets, Cutting Tool Geometry, Wear and Tool Life, Coolants	Cutting Tool Materials	Theoretical +	Questions and discussion
Eighth	2	Classification, Definition, Process and requirements,	Cutting with geometrically defined	Theoretical +	Questions and discussion

		Distribution of temperatures	cutting edges		
Ninth	2	Types and requirements, Types of clamping , Hybrid Turning Machine , Drilling Process, Milling, Tapping , Advantages and disadvantages, Broaching, Shapers, Planers.	geometrically defined cutting edges	Theoretical + tutorial	Questions and discussion
Tenth	2	Classification, Grinding, Types of Abrasives, wear, Advantages and Disadvantages of Honing, Lapping, Double Wheel Grinding .	Cutting with geometrically undefined cutting edges	Theoretical + tutorial	Questions and discussion
Eleventh	2	Classification, Grinding, Types of Abrasives, wear, Advantages and	Cutting with geometrically undefined cutting edges	Theoretical + tutorial	Questions and discussion
Twelfth	2	Disadvantages of Honing,Lapping, Double Wheel Grinding	Cutting with geometrically undefined cutting edges	Theoretical + tutorial	Questions and discussion
Thirteenth	2	Classification, Chemical removal, Types, Etching, Thermal removal, Classification,	Non-Conventional Cutting Technology	Theoretical + tutorial	Questions and discussion
Fourteenth	2	Electrical Discharges Machining EDM, Material removal mechanism Surface formation,	Non-Conventional Cutting Technology	Theoretical + tutorial	Questions and discussion
Fifteenth	2	Wire EDM, Manufacturing system of wire EDM, Laser machining, Types, Laser mechanism , Laser source, Electrochemical removal.	Non-Conventional Cutting Technology	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of materials science necessary to explain and solve engineering problems by identifying and diagnosing defects and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the material technology and manufacturing technology.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Engineering Materials Technology MAE314
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 3rd Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of material technology and manufacturing technology that include furnace types and their specification, casting technology and their types and the main applications. In addition, forming technology and their types and application as well as coating technology with its types.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and

interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Introduction of engineering materials technology	Introduction of engineering materials technology	theoretical	Questions and discussion
Second	2	Materials technology, manufacturing technology	Introduction of engineering materials technology	theoretical	Questions and discussion
Third	2	Classification of materials and classification of manufacturing methods	Introduction of engineering materials technology	theoretical	Questions and discussion
Fourth	2	Types of furnaces, heat losses from furnace during melting	Furnaces	theoretical	Questions and discussion
Five	2	Standing gas or oil fired furnaces and titling furnaces	Furnaces	theoretical	Questions and discussion
Sixth	2	Electric furnaces include arc furnace and induction furnace with their performance calculations.	Furnaces	theoretical	Questions and discussion
Seventh	2	Basic component of casting and advantiges with disadvantages of casting methods	Casting	theoretical	Questions and discussion
Eighth	2	Metal casting design	Casting	theoretical	Questions and discussion
Ninth	2	Casting methods with continuous casting	Casting	theoretical	Questions and discussion
Tenth	2	Forming technology with Classification of forming technology	Forming technology	theoretical	Questions and discussion
Eleventh	2	Massive forming technology includes pressing, extrusion, open die forgingand swaging	Forming technology	theoretical	Questions and discussion
Twelfth	2	Sheet metal forming technology includes deep drawing, separating, pulse	Forming technology	theoretical	Questions and discussion

		magnetic forming and electroforming			
Thirteenth	2	Coating technology with its definition and field of applications	Coating technology	theoretical	Questions and discussion
Fourteenth	2	Classification of coating technology	Coating technology	theoretical	Questions and discussion
Fifteenth	2	Electrochemical coating, cathode coating, laquare coating, powder coating, enamel coating and hot dipping	Coating technology	theoretical	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATEFORCOURSESPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of polymers engineering necessary to explain and solve engineering problems by identifying and diagnosing defects and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the polymers structure of polymers engineering and properties.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Polymers engineering MAE325
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 3rd Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	

8. Aims of the Course

The objective of this course is to introduce students to fundamental area of polymer engineering and preparation , which enables students to focus on the study of different polymers and structures effecting factors, physical and chemical properties of polymer engineering and processing of manufacturing the polymers . These principals allow the students to assess what could be achieved through this course when they are manufacturing of different polymers with different repeating units and different molecular weight to solve problems in engineering world .

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4.An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3.Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.

5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Classification of polymer engineering	Introduction of polymer engineering	theoretical	Questions and discussion
Second	2	Application of polymer engineering	Type of polymers	theoretical	Questions and discussion
Third	2	Comparison between polymers	Mechanical and chemical properties	theoretical	Questions and discussion
Fourth	2	Types of structures	Polymers state	Theoretical +	Questions and

				tutorial	discussion
Five	2	Improvement & developments	History of developments	Theoretical	Questions and discussion
Sixth	2	Manufacturing	Processing of polymers	Theoretical + tutorial	Questions and discussion
Seventh	2	Structure of the polymer engineering	Constituent of polymer engineering	Theoretical +	Questions and discussion
Eighth	2	Production of polymer engineering	Technological methods	Theoretical +	Questions and discussion
Ninth	2	Classification according polymers nature	Nature & syntheses polymers	Theoretical + tutorial	Questions and discussion
Tenth	2	Fabrication of polymer engineering according to types of molecules	Structure of molecules	Theoretical + tutorial	Questions and discussion
Eleventh	2	Mechanical properties of polymer engineering	Engineering Inspections	Theoretical + tutorial	Questions and discussion
Twelfth	2	Effect of damage on the mechanical properties	Changing in behavior of polymers	Theoretical + tutorial	Questions and discussion
Thirteenth	2	Viscoelastic behavior of polymers	Physical properties of polymers	Theoretical + tutorial	Questions and discussion
Fourteenth	2	Tailoring polymers materials	Methods of tailoring	Theoretical + tutorial	Questions and discussion
Fifteenth	2	Improvement of polymer engineering	Improvement Technology	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2.Key references (sources)	
A-Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides an introduction to the basic principles of failure of various engineering materials by identifying and analyzing these defects. The failure analysis process usually begins with hypothesis development. A cause-and-effect diagram may be used to identify and evaluate these variables. Next, the step of recreating the process/conditions that led to the failure begins by simulating environmental and operational factors. The results of this step are then analyzed to see how well the cause(s) of failure match the hypothesis. Once the matching process is complete, then comes the analysis step. During this step, analyze the data collected during the second stage by analyzing the mechanical, chemical and/or mineral components, both at the macroscopic and microscopic levels. Finally, the process moves to the damage rating or prevention stage. Depending on the nature of the failure and the results of the analysis, the goal of this stage can be to prevent future failures or manage operational procedures

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Failure of Engineering Materials MAE322
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 3rd Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The main objective of this course is to teach students and provide basic information related to the failure and evaluation of engineering materials and their occurrence in various engineering applications.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Mechanical Failure	Mechanical Failure	theoretical	Questions and discussion
Second	3	**General steps of failure investigation**	**General steps of failure investigation**	theoretical	Questions and discussion
Third	3	Fracture Failure	Fracture Failure	theoretical	Questions and discussion
Fourth	3	Fracture Failure	Fracture Failure	theoretical	Questions and discussion
Five	3	**Fracture Mechanics in Polymers**	**Fracture Mechanics in Polymers**	theoretical	Questions and discussion
Sixth	3	**Fracture of Ceramics**	**Fracture of Ceramics**	theoretical	Questions and discussion
Seventh	3	**Factors Affecting the Fracture of a Material**	**Factors Affecting the Fracture of a Material**	theoretical	Questions and discussion
Eighth	3	**Basics of Fracture Toughness**	**Basics of Fracture Toughness**	theoretical	Questions and discussion
Ninth	3	**Griffith energy criteria**	**Griffith energy criteria**	theoretical	Questions and discussion
Tenth	3	**Stress intensity factor**	**Stress intensity factor**	theoretical	Questions and discussion
Eleventh	3	**Fracture Toughness Testing**	**Fracture Toughness Testing**	theoretical	Questions and discussion
Twelfth	3	Factors that must be considered in Fracture Toughness Testing	Factors that must be considered in Fracture Toughness Testing	theoretical	Questions and discussion
Thirteenth	3	**Fatigue**	**Fatigue**	theoretical	Questions and discussion
Fourteenth	3	Wear	Wear	theoretical	Questions and discussion
Fifteenth	3	Creep Deformation in Materials	Creep Deformation in Materials	theoretical	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	**References:** 1- "Fundamentals of Engineering Materials" by Thornton, Peter A., and Vito J. Colangelo (1985). 2- " Materials Selection and Design" by M. A. Maleque and M. S. Salit (2013).
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides identification of the Analytical methods to solve the algebraic equation, linear and non-linear equation, ordinary differential equations, partial differential equation, Numerical differentiation and integration. Knowledge of the methods and how to deal with them in practical applications, as well as knowledge of the calculations related to them.

1. Teaching Institution	University of Basrah
2. University Department/Centre	Department of Engineering of Materials
3. Course title/code	Numerical Analysis MAE311
4. Modes of Attendance offered	Daily time + online

5. Semester/Year	2nd Semester/3rd Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	2021

8. Aims of the Course

The main objective of this course is studying and providing necessary scientific information and description related to the basic and important analytical methods to solve the simultaneous equations, ODE and PDE which the control equations on engineering systems when used in scientific and life applications and have a knowledge of the related calculations.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulates, and solves engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.

5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Complex Variables	Complex Variables	Theoretical + tutorial	Questions and discussion
Second	٣	Operations on complex variables	Complex Variables	Theoretical + tutorial	Questions and discussion
Third	٣	Line integral	Complex Variables	Theoretical + tutorial	Questions and discussion
Fourth	٣	Contour Integrals	Complex Variables	Theoretical + tutorial	Questions and discussion
Five	٣	Cautchy Remann Equations	Complex Variables	Theoretical + tutorial	Questions and discussion+ Quiz
Sixth	٣	Analytical Functions	Complex Variables	Theoretical + tutorial	Questions and discussion
Seventh	٣	Fourier's Transform	Fourier's Transform	Theoretical + tutorial	Questions and discussion
Eighth	٣	Fourier Integrals	Fourier's Transform	Theoretical +	Questions and discussion

				tutorial	
Ninth	٣	Complex Fourier Transform	Fourier's Transform	Theoretical + tutorial	Questions and discussion+ Quiz
Tenth	٣	Applications	PDE	Theoretical + tutorial	Questions and discussion
Eleventh	٣	Partial differential Equations	PDE	Theoretical + tutorial	Questions and discussion
Twelfth	٣	D'Elembert Equations	PDE	Theoretical + tutorial	Questions and discussion+ Quiz
Thirteenth	٣	Elliptic Equations	PDE	Theoretical + tutorial	Questions and discussion
Fourteenth	٣	Parabolic Equations	PDE	Theoretical + tutorial	Questions and discussion
Fifteenth	٣	Hyperbolic Equations	PDE	Theoretical + tutorial	Questions and discussion+Quiz

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Advanced Engineering Mathematics Erwin Kreyszig
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports, ...	Advanced Engineering Analysis Leonid P. Lebediv
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides identification of the Analytical methods to solve the algebraic equation, linear and non-linear equation, ordinary differential equations, partial differential equation, Numerical differentiation and integration. Knowledge of the methods and how to deal with them in practical applications, as well as knowledge of the calculations related to them.

1. Teaching Institution	University of Basrah
2. University Department/Centre	Department of Engineering of Materials
3. Course title/code	Heat Treatment of Ferrous Metals MAE313
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st. Semester/3rd Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	2021
8. Aims of the Course	
The main objective of this course is studying and providing necessary scientific information and description related to the basic and important analytical methods to solve the simultaneous equations, ODE and PDE which the control equations on engineering systems when used in scientific and life applications and have a knowledge of the related calculations.	
9· Learning Outcomes, Teaching, Learning and Assessment Method	
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulates, and solves engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	
B. Subject-specific skills B1. The ability to select engineering materials for scientific and industrial applications. B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them. B3. Writing scientific reports, reading blueprints and analyzing engineering	

materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Fundamentals of the heat treatment of steel	Classification of steels, why steel is important, metallurgical phenomena, constitution of iron.	Theoretical + tutorial	Questions and discussion
second	٣	alloying mechanisms	effect of carbon on the constitution of iron, iron-cementite phase diagram, transformation of austenite	theoretical + tutorial	questions and discussion
Third	٣	Heat treatment	heat treatment processes, annealing , normalizing	Theoretical + tutorial	Questions and discussion
Fourth	٣	Heat treatment	Isothermal transportation, continuous cooling transportation diagrams, hardening	Theoretical + tutorial	Questions and discussion
Five	٣	Heat treatment	Hardenability , tempering, retained austenite, sub-zero treatment	Theoretical + tutorial	Questions and discussion+ Quiz
Sixth	٣	Spacial heat treatment	Austempering , martempering	Theoretical + tutorial	Questions and discussion
Seventh	٣	Chemical heat treatment	Case hardening , surface hardening	Theoretical + tutorial	Questions and discussion
Eighth	٣	Heat treatment of plain carbon steel	Low carbon steel , medium carbon steel , high carbon	Theoretical + tutorial	Questions and discussion

			steel		
Ninth	٣	Heat treatment of alloy steels	Effect of alloying elements	Theoretical + tutorial	Questions and discussion+ Quiz
Tenth	٣	Heat treatment of alloy steels	Heat treatment of steel containing nickel, heat treatment of steel containing chromium, heat treatment for steel containing Ni, Cr .	Theoretical + tutorial	Questions and discussion
Eleventh	٣	Heat treatment of alloys steel	Heat treatment of steel containing molybdenum, vanadium, manganese, tungsten, cobalt. Heat treatment of high speed steel.	Theoretical + tutorial	Questions and discussion
Twelfth	٣	Heat treatment for rolled steel	Heat treatment of cold drawn rolled steel, hot drawn rolled steel, wires, steel casting	Theoretical + tutorial	Questions and discussion+ Quiz
Thirteenth	٣	Heat treatment for rolled steel	Heat treatment for forging, gears, cutting tool, steel drills, screw tap tools	Theoretical + tutorial	Questions and discussion
Fourteenth	٣	Heat treatment of cast iron	Heat treatment of gray cast iron, heat treatment for white cast iron	Theoretical + tutorial	Questions and discussion
Fifteenth	٣	Heat treatment of cast iron	Heat treatment of ductile iron , heat treatment of malleable iron	Theoretical + tutorial	Questions and discussion+Quiz

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Advanced Engineering Mathematics Erwin Kreyszig
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports, ...	Advanced Engineering Analysis Leonid P. Lebediv
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides identification of the Analytical methods to solve the algebraic equation, linear and non-linear equation, ordinary differential equations, partial differential equation, Numerical differentiation and integration. Knowledge of the methods and how to deal with them in practical applications, as well as knowledge of the calculations related to them.

1. Teaching Institution	University of Basrah
2. University Department/Centre	Department of Engineering of Materials
3. Course title/code	Heat Treatment of Non Ferrous Metals MAE323
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st. Semester/3rd Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	2021

8. Aims of the Course

The main objective of this course is studying and providing necessary scientific information and description related to the basic and important analytical methods to solve the simultaneous equations, ODE and PDE which the control equations on engineering systems when used in scientific and life applications and have a knowledge of the related calculations.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulates, and solves engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.

8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	heat treatment of copper metal	Heat treatment of pure copper , copper zinc alloy	Theoretical + tutorial	Questions and discussion
second	٣	heat treatment of copper metal	Heat treatment of copper tin	theoretical + tutorial	questions and discussion

			alloys ,		
Third	٣	heat treatment of copper metal	Heat treatment of single and two phase cu-Al alloys,	Theoretical + tutorial	Questions and discussion
Fourth	٣	heat treatment of copper metal	Heat treatment of copper aluminum alloy	Theoretical + tutorial	Questions and discussion
Five	٣	heat treatment of copper metal	Heat treatment of copper-berylium alloys	Theoretical + tutorial	Questions and discussion+ Quiz
Sixth	٣	heat treatment of copper metal	Heat treatment of copper-nickel-silicon alloys,	Theoretical + tutorial	Questions and discussion
Seventh	٣	heat treatment of copper metal	Heat treatment of copper - nickel-manganese alloy	Theoretical + tutorial	Questions and discussion
Eighth	٣	Heat treatment of zinc	Heat treatment of pure zinc	Theoretical + tutorial	Questions and discussion
Ninth	٣	Heat treatment of zinc	Heat treatment of zinc alloys	Theoretical + tutorial	Questions and discussion+ Quiz
Tenth	٣	Heat treatment of titanium alloys	Heat treatment of titanium alloys	Theoretical + tutorial	Questions and discussion
Eleventh	٣	Heat treatment of aluminum and its alloys	Heat treatment of pure aluminum	Theoretical + tutorial	Questions and discussion
Twelfth	٣	Heat treatment of aluminum and its alloys	Heat treatment of aluminum alloys	Theoretical + tutorial	Questions and discussion+ Quiz
Thirteenth	٣	Heat treatment of aluminum and its alloys	Precipitation hardening, application for heat treatments of the aluminum alloys	Theoretical + tutorial	Questions and discussion

Fourteenth	٣	Heat treatment of magnesium and its alloys	Heat treatment of pure magnesium	Theoretical + tutorial	Questions and discussion
Fifteenth	٣	Heat treatment of magnesium and its alloys	Heat treatment of magnesium alloys	Theoretical + tutorial	Questions and discussion+Quiz

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Advanced Engineering Mathematics Erwin Kreyszig
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports, ...	Advanced Engineering Analysis Leonid P. Lebediv
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The module provides an introduction to the basics of the science of the behavior of engineering materials for the purpose of defining the nature of engineering materials and understanding the internal structural systems of these materials in terms of atomic and crystal bonding. The relationship between these crystal structures and the specifications of materials and their engineering behavior. Moreover their industrial properties. The course provides basic information about the properties of engineering materials and their mechanical, electrical, magnetic and optical behaviour. Additionally, the relationship of this behavior to different applications..

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Behaviour of engineering materials
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 3rd Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	

8. Aims of the Course

The aim of this module is to provide students with basic and necessary knowledge of the behaviour of engineering materials. Engineering materials definition and description. Deferences between engineering materials and other materials. Mechanical, electrical, magnetic and optical behaviour of the engineering materials. Relation between materials behaviour and their applications.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Engineering materials definition, description and classification	Engineering materials	theoretical	Questions and discussion
Second	3	Entity of the engineering materials, atomic bonding	Engineering materials	theoretical	Questions and discussion
Third	3	Atomic bonding types of different engineering materials	Engineering materials	theoretical	Questions and discussion
Fourth	3	Crystal structure of the engineering materials, metallic materials	Engineering materials	Theoretical + tutorial	Questions and discussion
Five	3	Crystal structure of the engineering materials, ceramic materials	Engineering materials	Theoretical	Questions and discussion
Sixth	3	Crystal structure of the engineering materials, polymeric materials	Engineering materials	Theoretical + tutorial	Questions and discussion
Seventh	3	Crystal structure of the engineering materials, bio materials	Engineering materials	Theoretical +	Questions and discussion
Eighth	3	Mechanical properties 1	Mechanical behaviour	Theoretical +	Questions and discussion
Ninth	3	Mechanical properties 2	Mechanical behaviour	Theoretical + tutorial	Questions and discussion
Tenth	3	Mechanical properties 3	Mechanical behaviour	Theoretical + tutorial	Questions and discussion
Eleventh	3	Magnetic materials and their properties	Magnetic behaviour	Theoretical + tutorial	Questions and discussion
Twelfth	3	Magnetic field, hysteresis, domain and applications	Magnetic behaviour	Theoretical + tutorial	Questions and discussion

Thirteenth	3	Electrical materials and their properties, conductors and insulators	Electrical behaviour	Theoretical + tutorial	Questions and discussion
Fourteenth	3	Heat conductors and insulators	Thermal behaviour	Theoretical + tutorial	Questions and discussion
Fifteenth	3	Optical properties of the engineering materials and their application	Optical behaviour	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Materials handbook, by François Cardarelli
2. Key references (sources)	Materials for Engineers ،William F. Hosford
A- Recommended books and references (scientific journals, reports ,....	Materials science and engineering journals
B- Electronic references, websites	Relevant scientific and industrial websites

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides an introduction to the practical application of theoretical materials, which are thermal coefficients, technology, ceramics, corrosion and heat transfer. The practical aspect is used to evaluate the practical results of these experiments and to support theoretical teaching, allowing the student to observe and evaluate laboratory results. Practical experiments are conducted in accordance with safety regulations and instructions in order to teach the student to follow the correct procedures during conducting practical experiments and to ensure the safety of

students and laboratory workers

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	laboratories MAE318
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 3rd Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The main objective of this course is to teach students and provide basic information related to conducting practical experiments related to materials, heat treatment, technology, ceramics, corrosion and heat transfer.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
B. Subject-specific skills B1. The ability to select engineering materials for scientific and industrial applications. B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them. B3. Writing scientific reports, reading blueprints and analyzing engineering materials. B4. The ability to keep pace with developments in engineering materials and their properties.
Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	**Annealing,welding,grain size measurement,corrosion rate**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write

		measurement,refreizing			report
Second	3	**Annealing,welding,grain size measurement,corrosion rate measurement,refreizing**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Third	3	**Annealing,welding,grain size measurement,corrosion rate measurement,refreizing**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Fourth	3	**Annealing,welding,grain size measurement,corrosion rate measurement,refreizing**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Five	3	**hardening,arc welding,density of ceramic,galvanizing,**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Sixth	3	**hardening,arc welding,density of ceramic,galvanizing,**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Seventh	3	**hardening,arc welding,density of ceramic,galvanizing,**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Eighth	3	**hardening,arc welding,density of ceramic,galvanizing,**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Ninth	3	**Tempering,casting,weight loss measurement**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Tenth	3	**Tempering,casting,weight loss measurement**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Eleventh	3	**Tempering,casting,weight loss measurement**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Twelfth	3	**Tempering,casting,weight loss measurement**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Thirteenth	3	**Tempering,casting,weight loss measurement**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report
Fourteenth	3	**exercises**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write

					report
Fifteenth	3	**exercises**	Heat treatments + Eng. Mat. Technology + ceramic + corrosion + heat transfer	Practical	Questions, discussion and write report

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	References: ASTM, C. "ASTM standards." Philadelphia: American Society for Testing Materials (1958). Rajan, T. V., et al. Heat treatment: principles and techniques. PHI Learning Pvt. Ltd., 2011. Bejan, Adrian, and Allan D. Kraus, eds. Heat transfer handbook. Vol. 1. John Wiley & Sons, 2003. Carter, C. Barry, and M. Grant Norton. Ceramic materials: science and engineering. Springer Science & Business Media, 2007.
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides an identification of the practical application of theoretical materials, which are heat treatments, welding, cutting, polymers, corrosion and heat transfer. The experimental application is used to evaluate the practical results of these experiments and to support theoretical teaching, allowing the student to observe and evaluate laboratory results. Practical experiments are conducted in accordance with safety regulations and instructions in order to teach the student to follow the correct procedures during conducting practical experiments and to ensure the safety of students and laboratory workers

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	laboratories MAE328
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2st Semester/ 3rd Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The main objective of this course is to teach students and provide basic information related to conducting practical experiments related to heat treatment, welding, cutting, polymers, corrosion and heat transfer.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories. 5- Graduation projects. 6- Scientific visits. 7- Seminars held in the department. 8- Summer training.
Assessment methods
1- Short exams (Quiz). 2- Homework. 3- Semester and final exams for theoretical and practical subjects. 4- Small projects within the lesson. 5- Interaction within the lecture. 6- Reports.
C. Thinking Skills C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall C2. Response: Follow up the student's interaction with the material displayed on the screen C3. Attention: Follow up on the interest of the student who interacted the most with the presented material. C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it. C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.
D. General and Transferable Skills (other skills relevant to employability and personal development) D1. Develop the student's ability to deal with technology. D2. Developing the student's ability to deal with the Internet. D3. Developing the student's ability to deal with multiple means. D4. Develop the student's ability to dialogue and discussion.

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method

First	3	**Surface hardening, SMAW Shielded Metal Arc Welding, Shore hardness Trial, heat transfer turbulent flow**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Second	3	**Surface hardening, SMAW Shielded Metal Arc Welding, Shore hardness Trial, heat transfer turbulent flow**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Third	3	**Surface hardening, SMAW Shielded Metal Arc Welding, Shore hardness Trial, heat transfer turbulent flow**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Fourth	3	**Surface hardening, SMAW Shielded Metal Arc Welding, Shore hardness Trial, heat transfer turbulent flow**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Five	3	**carburizing, spot welding, tensile Trial, heat transfer lamellar flow**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Sixth	3	**carburizing, spot welding, tensile Trial, heat transfer lamellar flow**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Seventh	3	**carburizing, spot welding, tensile Trial, heat transfer lamellar flow**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Eighth	3	**carburizing, spot welding, tensile Trial, heat transfer lamellar flow**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Ninth	3	**carburizing, spot welding, tensile Trial, heat transfer lamellar flow**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Tenth	3	**Nitriding, TIG welding, impact Trial, heat excahnger**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Eleventh	3	**Nitriding, TIG welding, impact Trial, heat excahnger**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Twelfth	3	**Nitriding, TIG welding, impact Trial, heat excahnger**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Thirteenth	3	**Nitriding, TIG welding, impact Trial, heat excahnger**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report

Fourteenth	3	**examination**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report
Fifteenth	3	**examination**	Heat treatments + Welding & Cutting + Polymers + corrosion + heat transfer	Practical	Questions, discussion and write report

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	References: Kou, Sindo. "Welding metallurgy." New Jersey, USA 431.446 (2003): 223-225. Rajan, T. V., et al. Heat treatment: principles and techniques. PHI Learning Pvt. Ltd., 2011. Bejan, Adrian, and Allan D. Kraus, eds. Heat transfer handbook. Vol. 1. John Wiley & Sons, 2003.
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of industrial engineering that includes methods for making decision by theoretical models and production management. They explain decision theory and mathematical models and productivity with industrial maintenance. In addition, theory of replacement with models and international standard specification with project control inventory and location problems as production management.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Industrial Engineering MAE416
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 3rd Year
6. Number of hours tuition (total)	30 hrs.
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of industrial engineering and production management that includes decision theory and mathematical models with maintenance and inventory management as well as allocation problems with balancing production lines.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories. 5- Graduation projects. 6- Scientific visits. 7- Seminars held in the department. 8- Summer training.
Assessment methods
1- Short exams (Quiz). 2- Homework. 3- Semester and final exams for theoretical and practical subjects. 4- Small projects within the lesson. 5- Interaction within the lecture. 6- Reports.
C. Thinking Skills C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall C2. Response: Follow up the student's interaction with the material displayed on the screen C3. Attention: Follow up on the interest of the student who interacted the most with the presented material. C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it. C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.
D. General and Transferable Skills (other skills relevant to employability and personal development) D1. Develop the student's ability to deal with technology. D2. Developing the student's ability to deal with the Internet. D3. Developing the student's ability to deal with multiple means. D4. Develop the student's ability to dialogue and discussion.

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method

First	2	Decision theory	Industrial Engineering	Theoretical + tutorial	Questions and discussion
Second	2	Mathematical models	Industrial Engineering	Theoretical + tutorial	Questions and discussion
Third	2	Game theory	Industrial Engineering	Theoretical + tutorial	Questions and discussion
Fourth	2	Linear programming	Industrial Engineering	Theoretical + tutorial	Questions and discussion
Five	2	Quality control	Industrial Engineering	Theoretical	Questions and discussion
Sixth	2	Industrial engineering jobes	Industrial Engineering	Theoretical + tutorial	Questions and discussion
Seventh	2	Productivity	Industrial Engineering	Theoretical +	Questions and discussion
Eighth	2	Industrial maintenance	Industrial Engineering	Theoretical +	Questions and discussion
Ninth	2	Oberation research and web analysis	Industrial Engineering	Theoretical + tutorial	Questions and discussion
Tenth	2	Theory of substitution and replacement	Production Management	Theoretical + tutorial	Questions and discussion
Eleventh	2	Maintenance and replacement models	Production Management	Theoretical + tutorial	Questions and discussion
Twelfth	2	International standard specification ISO	Production Management	Theoretical + tutorial	Questions and discussion
Thirteenth	2	Analysis of business networks and evaluate projects	Production Management	Theoretical + tutorial	Questions and discussion
Fourteenth	2	Control of inventories	Production Management	Theoretical + tutorial	Questions and discussion
Fifteenth	2	Allocation problems, relay and balancing production lines	Production Management	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This module deals with the nanomaterials definition and nature. Therefore, their characterisation methods are involved, according to their sizes and types. Moreover, their differences, features and safety are embedded. It also covers the study of their shapes and properties in different compounds. Characterise, observe and analysis of them by means of electron microscopy and X-ray techniques, as well as some mechanical methods. Subsequently, production and synthesis methods are expressed, the main categories are top-down and bottom up methods. The outcome of the module; students will have the basic knowledge and should be able to recognise different nanomaterials, characterisation methods, production methods, properties and applications.

1. Teaching Institution	Basra University
2. University Department/Centre	Materials engineering
3. Course title/code	Nanomaterials
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 4th Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	2021
8. Aims of the Course	
The outcome of the module; students will have the basic knowledge and should be able to recognise different nanomaterials, characterisation methods, production methods, properties and applications.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Introduction, definition and description	Nanomaterials	theoretical	Questions and discussion
Second	3	Zero dimensional nanostructures: nanoparticles	Morphology of nanomaterials	theoretical	Questions and discussion
Third	3	One-dimensional nanostructures: nanowires and nanorods	Morphology of nanomaterials	theoretical	Questions and discussion
Fourth	3	Two-dimensional nanostructures: thin films	Morphology of nanomaterials	Theoretical + tutorial	Questions and discussion
Five	3	Top-down approaches1	Nanostructures fabricated	Theoretical	Questions and discussion
Sixth	3	Top-down approaches2	Nanostructures fabricated	Theoretical + tutorial	Questions and discussion
Seventh	3	Top-down approaches3	Nanostructures fabricated	Theoretical +	Questions and discussion

Eighth	3	Bottom-up approaches1	Nanostructures fabricated	Theoretical +	Questions and discussion
Ninth	3	Bottom-up approaches2	Nanostructures fabricated	Theoretical + tutorial	Questions and discussion
Tenth	3	Bottom-up approaches3	Nanostructures fabricated	Theoretical + tutorial	Questions and discussion
Eleventh	3	Techniques, tools and devices	Characterization techniques for nanomaterials	Theoretical + tutorial	Questions and discussion
Twelfth	3	Structural characterization.	Characterization techniques for nanomaterials	Theoretical + tutorial	Questions and discussion
Thirteenth	3	Chemical characterization.	Characterization techniques for nanomaterials	Theoretical + tutorial	Questions and discussion
Fourteenth	3	Physical properties of nanomaterials	Characterization techniques for nanomaterials	Theoretical + tutorial	Questions and discussion
Fifteenth	3	Applications of nanomaterials	Nanomaterials uses	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Nanomaterials, Nanotechnologies and Design, Authors: Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek
2. Key references (sources)	Handbook of Nanomaterials Properties, Authors: Bharat Bhushan • Dan Luo
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	Relevant scientific and industrial websites

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of materials science necessary to explain and solve engineering problems by identifying and diagnosing defects and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the crystal structure of engineering materials and phase charts.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	**Powder Metallurgy MAE414**
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 4th Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of powder and sintering, compactions processes which enables students to focus on the study of fundamentals of powder metallurgy technique and study the physical , chemical properties, and Applications of powder metallurgy	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.
D3. Developing the student's ability to deal with multiple means.
D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Chemical composition, Particle size and distribution, Particle shape, Specific surface, Apparent density, Flow rate,	Characterization and Testings of Metal Powders	theoretical	Questions and discussion
Second	3	Green density, Green strength, Green spring,	Pressing properties	theoretical	Questions and discussion
Third	3	Dimensional change during sintering, Sintered density, Porosity,	Properties of sintered compacts	theoretical	Questions and discussion
Fourth	3	Mechanical properties of sintered compacts	Properties of sintered compacts	Theoretical + tutorial	Questions and discussion
Five	3	Mechanical Processes: Machining, Crushing, Milling, Shotting, Graining, and Atomization.	Powder Manufacturing	Theoretical	Questions and discussion
Sixth	3	Physico-Chemical and Chemical Processes: Condensation method, Thermal	Powder Manufacturing	Theoretical + tutorial	Questions and discussion

		decomposition method, Reduction method,			
Seventh	3	Electrodeposition method, Precipitation from aqueous solution, Precipitation from fused salts,	Powder Manufacturing	Theoretical +	Questions and discussion
Eighth	3	Gaseous reduction process, Intergranular corrosion, Oxidation and decarburization	Powder Manufacturing	Theoretical +	Questions and discussion
Ninth	3	Preliminary heat treatment Blending and mixing	-Powder Conditioning	Theoretical + tutorial	Questions and discussion
Tenth	3	Pressureless shaping technique Cold pressure shaping technique	Powder Compaction.	Theoretical + tutorial	Questions and discussion
Eleventh	3	Pressure shaping technique with heat: Hot Pressing, Sinter forging,	Powder Compaction.	Theoretical + tutorial	Questions and discussion
Twelfth	3	Hot rolling, Hot – Isostatic compaction, Spark sintering, Hot coining	Powder Compaction.	Theoretical + tutorial	Questions and discussion
Thirteenth	3	Stages of sintering, Mechanisms of sintering,	Sintering	Theoretical + tutorial	Questions and discussion
Fourteenth	3	Liquid phase sintering, Infiltration, Sintering	Sintering	Theoretical + tutorial	Questions and discussion

		atmosphere			
Fifteenth	3	Bearing materials, Friction materials, Tool materials, Ferrites, Cermets	Applications	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATEFORCOURSESPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of polymers engineering necessary to explain and solve engineering problems by identifying and diagnosing defects and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the polymers structure of polymers engineering and properties.

1. Teaching Institution	

2. University Department/Centre	
3. Course title/code	Composite Materials MAE413
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 3rd Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	

8. Aims of the Course

The objective of this course is to introduce students to fundamental area of composite materials and preparation, which enables students to focus on the study of different matrix and fillers effecting factors, physical and chemical properties of composite materials and processing of manufacturing the composites . These principals allow the students to assess what could be achieved through this course when they are manufacturing of different composites with different matrix(polymer, metal , ceramic) and different fillers(particles , fibers) to solve problems in industries.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4.An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3.Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.

6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Classification of composites	Introduction of composite materials	theoretical	Questions and discussion
Second	2	Explanation of different matrix composites	Type of matrix	theoretical	Questions and discussion
Third	2	Comparison between composites	Mechanical and physical properties	theoretical	Questions and discussion
Fourth	2	Types of fillers	Additives of matrix	Theoretical +	Questions and

				tutorial	discussion
Five	2	Short and continuous fibers	Types of fibers	Theoretical	Questions and discussion
Sixth	2	Classification of fibers orientations	Lamina orientation	Theoretical + tutorial	Questions and discussion
Seventh	2	Structure of the composite materials	Constituent of composite	Theoretical +	Questions and discussion
Eighth	2	Processing of composite materials	Technological methods	Theoretical +	Questions and discussion
Ninth	2	Classification according to matrix	geometrically defined cutting edges	Theoretical + tutorial	Questions and discussion
Tenth	2	Fabrication of composites according to types of reinforcement	Reinforcement fillers	Theoretical + tutorial	Questions and discussion
Eleventh	2	Mechanical properties of composite materials	Engineering Inspections	Theoretical + tutorial	Questions and discussion
Twelfth	2	Effect of damage on the mechanical properties	Changing in behavior of composites	Theoretical + tutorial	Questions and discussion
Thirteenth	2	Viscoelastic behavior of composite	Physical properties	Theoretical + tutorial	Questions and discussion
Fourteenth	2	Tailoring composite materials	Methods of tailoring	Theoretical + tutorial	Questions and discussion
Fifteenth	2	Improvement of composite	Improvement Technology	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2.Key references (sources)	
A-Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of materials science necessary to explain and solve engineering problems by identifying and diagnosing defects and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the crystal structure of engineering materials and phase charts.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Selection of engineering materials for design MAE421
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 4th Year
6. Number of hours tuition (total)	90 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of design and selection of engineering materials which enables students to focus on the study of design factors, to create products that perform their function effectively, safely, at acceptable cost. materials selection involves seeking the best match between the design requirements and the materials attributes. These principals allow the students to assess what could be achieved through this course when they are using the systematic selection procedures to select optimum materials and processes for a given component.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.
D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Material Selection Factors, Aims of Material processing,	The relationship between material selection and materials processing	theoretical	Questions and discussion
Second	3	Why processing may influence material selection, Process selection criteria	The relationship between material selection and materials processing	theoretical	Questions and discussion
Third	3	Performance Indices, Material Property Charts,	*MATERIALS SELECTION IN MECHANICAL DESIGN*	theoretical	Questions and discussion
Fourth	3	The Role of Materials Selection in Design, exploring relationships,	Materials Selection in Design	Theoretical + tutorial	Questions and discussion
Five	3	materials property charts, the materials selection process design models, materials indices	Materials Selection in Design	Theoretical	Questions and discussion
Sixth	3	Component Design, Manufacturing Techniques,	Economic consideration in materials selection	Theoretical + tutorial	Questions and discussion
Seventh	2	Environmental and Societal Considerations	, Economic consideration in materials selection	Theoretical + tutorial	Questions and discussion
Eighth	2	Selection of materials to resist elastic failure	Elastic deformation, Stress-Strain Behaviour:	Theoretical +	Questions and discussion
Ninth	2	Selection of materials to resist elastic failure	Nonlinear Elastic Behavior, Theories of Elastic Failure.	Theoretical + tutorial	Questions and discussion
Tenth	2	Case study	Hip replacement process	Theoretical + tutorial	Questions and discussion
Eleventh	2	Case study	Valve spring of internal combustion engine.,	Theoretical + tutorial	Questions and discussion
Twelfth	2	Case study	Materials for Bearings.	Theoretical + tutorial	Questions and discussion

Thirteenth	2	Case study	Materials for Bearings.	Theoretical + tutorial	Questions and discussion
Fourteenth	2	Case study	Failure analysis of automobile axle	Theoretical + tutorial	Questions and discussion
Fifteenth	2	Case study	Failure analysis of automobile axle	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	*(1) Selection and Use of Engineering Materials; Third edition; J. A. Charles, F. A. A. Crane, J. A. G. Furness MA.*
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of X-Ray Diffraction and Microscopy necessary to explain and solve engineering problems by identifying and component , properties and the possibility of solving the problem and the issue in an engineering style based on X-Ray Diffraction principles where the course allows to deal with the structure of engineering elements and inspection microscopic.

1. Teaching Institution	
2. University Department/Centre	

3. Course title/code	X-Ray Diffraction and Microscopy MAE422
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 4th Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	

8. Aims of the Course
The objective of this course is to study and understanding the principle of X-ray Production, Interference and Diffraction, and characteristic X-ray, Transmission Electron Microscope (TEM) and Scanning Electron Microscope (SEM), Construction , and Application.

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
B. Subject-specific skills B1. The ability to select engineering materials for scientific and industrial applications. B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them. B3. Writing scientific reports, reading blueprints and analyzing engineering materials. B4. The ability to keep pace with developments in engineering materials and their properties.
Teaching and Learning Methods
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories. 5- Graduation projects. 6- Scientific visits. 7- Seminars held in the department. 8- Summer training.

Assessment methods
1- Short exams (Quiz). 2- Homework. 3- Semester and final exams for theoretical and practical subjects. 4- Small projects within the lesson. 5- Interaction within the lecture. 6- Reports.
C. Thinking Skills C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall C2. Response: Follow up the student's interaction with the material displayed on the screen C3. Attention: Follow up on the interest of the student who interacted the most with the presented material. C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it. C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.
D. General and Transferable Skills (other skills relevant to employability and personal development) D1. Develop the student's ability to deal with technology. D2. Developing the student's ability to deal with the Internet. D3. Developing the student's ability to deal with multiple means. D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Introduction , X-ray Production, Interference and Diffraction, ,	Introduction	theoretical	Questions and discussion
Second	3	Braggs Law, Continuous X-ray , Characteristic X-ray , X-ray Absorption & Filtration ,	Introduction	theoretical	Questions and discussion
Third	3	Monochromatic X-ray , Diffraction Methods,	X-ray , Diffraction Methods	theoretical	Questions and discussion

Fourth	3	Laue Method,	X-ray , Diffraction Methods	Theoretical + tutorial	Questions and discussion
Five	3	Rotating Crystal Method, Powder Method,	X-ray , Diffraction Methods	Theoretical	Questions and discussion
Sixth	3	Diffractometer, Spectrometer ,	X-ray , Diffraction Methods	Theoretical + tutorial	Questions and discussion
Seventh	3	Transmission Electron Microscope (TEM) ,	Transmissio n Electron Microscope	Theoretical +	Questions and discussion
Eighth	3	Sample Preparation , Lens Defects ,	Transmissio n Electron Microscope	Theoretical +	Questions and discussion
Ninth	3	Resolving power, Depth of field,	Transmissio n Electron Microscope	Theoretical + tutorial	Questions and discussion
Tenth	3	Depth of focus , TEM Construction ,	Transmissio n Electron Microscope	Theoretical + tutorial	Questions and discussion
Eleventh	3	TEM Application,.	Transmissio n Electron Microscope	Theoretical + tutorial	Questions and discussion
Twelfth	3	Scanning Electron Microscope (SEM) ,	Scanning Electron Microscope	Theoretical + tutorial	Questions and discussion
Thirteenth	3	SEM Construction , SEM Applications	Scanning Electron Microscope	Theoretical + tutorial	Questions and discussion
Fourteenth	3	exercisers	exercisers	Theoretical + tutorial	Questions and discussion
Fifteenth	3	exercisers	exercisers	Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Egerton, R.F., 2005. Physical principles of electron microscopy (Vol. 56). New York: Springer. Egerton, R.F., 2005. Physical principles of electron microscopy (Vol. 56). New York: Springer.
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	Waseda, Y., Matsubara, E. and Shinoda, K., 2011. X-ray diffraction crystallography: introduction, examples and solved problems. Springer Science & Business Media. Cullity, B.D., 1956. Elements of X-ray

	Diffraction. Addison-Wesley Publishing.
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This course provides a thorough knowledge of project characteristics and the project environment and the study of project economics, defining project objectives and planning methods including bar graphs, CPM and PERT, and project organization including functional structures, projects, matrix, conflict and negotiation.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Project Management MAE426
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2st. Semester/ 4th Year
6. Number of hours tuition (total)	90 hrs.
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to fully understand the characteristics of the project, the project environment and the study of project economics. Moreover, setting Goals, The Project Manager interpersonal skills, Risk Management, Management Styles, establishing Project Plants, Planning methods including Bar Charting, CPM and PERT, Project Organization including Functional, Project, and Matrix Structures, Conflict and Negotiation.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the

presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

Week	Hours	ILOs	Teaching Method	Assessment Method
First	6	Project definition ,Project management definition, Project management processes, Project Life cycle ,History of project management, Setting goals of the project.	Theoretical + tutorial	Questions and discussion
Second	6	The role of the project manager the project management challenge, the main responsibilities and functions of the project manager.	Theoretical + tutorial	Questions and discussion
Third	6	The project Manager and Communication styles, Time management, Communication styles of the manager	Theoretical + tutorial	Questions and discussion
Fourth	6	Project Organization I (Functional, Project & Matrix Structures).	Theoretical + tutorial	Questions and discussion
Five	6	Project Organization II (Functional, Project & Matrix Structures).	Theoretical + tutorial	Questions and discussion
Sixth	6	Conflict Management Root causes of conflict The Conflict Process, Modes of conflict resolution.	Theoretical + tutorial	Questions and discussion
Seventh	6	Negotiation: Definition and Approaches, bargaining zone model, Negotiation Process, Emotional intelligence, Negotiation Setting.	Theoretical + tutorial	Questions and discussion
Eighth	6	Planning Methods I, Bar Chart (Gantt Chart)	Theoretical + tutorial	Questions and discussion
Ninth	6	Planning Methods II, Critical Path Method (CPM), Activity-On-Node Method (AON) , Activity-On-Arrow Method (AOA).	Theoretical + tutorial	Questions and discussion
Tenth	6	Planning Methods III, Critical Path Method (CPM) , Activity-On-Node Method (AON) , Activity-On-Arrow	Theoretical + tutorial	Questions and discussion

		Method (AOA).		
Eleventh	6	Planning Methods IV, Program Evaluation and Review Technique (PERT).	Theoretical + tutorial	Questions and discussion
Twelfth	6	Planning Methods V, Program Evaluation and Review Technique (PERT), Exercises.	Theoretical + tutorial	Questions and discussion
Thirteenth	6	Risk Management I, Risk Management Process, Risk Assessment.	Theoretical + tutorial	Questions and discussion
Fourteenth	6	Risk Management II, Risk Response Development, Contingency plan, Opportunity Management.	Theoretical + tutorial	Questions and discussion
Fifteenth	6	Risk Management III, Risk Response control, Change Management, Procedure of change control, Change requests, Approved change request.	Theoretical + tutorial	Questions and discussion

12. Infrastructure

1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	Larson, E. W and Gray, C. F. (2014). Project management: The managerial process (6thedition), McGraw-Hill, Irwin. Kerzner, H. R. (2013).Project management: A systems approach to planning, scheduling, and controlling. John Wiley & Sons. Cleland, D. I.,& Ireland, L. R. (2006).Project management: Strategic design and implementation(5thedition). New York: McGraw-Hill. Morris, P.W.G, Pinto, J.K. and Soderlund, J. (2011).The Oxford handbook of project management. Oxford: Oxford University Press. Meredith, J.R. and. Mantel, S.J. (2012). Project management: A managerial approach (8thedition), John Wiley & Sons Rosenau, M. D., and Githens, G. D. (2011).Successful project management: a step- by-step approach with practical examples. Wiley. Westland, J. (2007).The project management life cycle: A complete step-by-step methodology for initiating, planning, executing & closing a project successfully. Kogan Page Publishers.
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides an introduction to the basic principles of non-destructive tests and how non-destructive tests play a very important role in quality control of materials or products as they are used in all stages of manufacturing to control the quality of all processes, including the raw materials used in the manufacture of the product or material and the stages of its manufacturing processes The use of non-destructive testing methods has great benefits because it increases the knowledge and evaluation of the safety and reliability of the product, knowing that all non-destructive testing methods work side by side and they are not test alternatives but rather they are all complementary to each other.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Non Destructive Testing MAE412
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 4th Year
6. Number of hours tuition (total)	30 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The main objective of this course is to teach students and provide basic information related to the various nondestructive testing methods, techniques, advantages and limitations of their work in different engineering applications.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Introduction	Introduction	theoretical	Questions and discussion
Second	2	Benefits and Limitations of nondestructive testing	Benefits and Limitations of nondestructive testing	theoretical	Questions and discussion
Third	2	Conditions For Effective Non-destructive Testing	Conditions For Effective Non-destructive Testing	theoretical	Questions and discussion
Fourth	2	Visual testing (VT)	Visual testing (VT)	theoretical	Questions and discussion
Five	2	HARDNESS TEST	HARDNESS TEST	theoretical	Questions and discussion
Sixth	2	Liquid Penetrant Testing (PT(	Liquid Penetrant Testing (PT(	theoretical	Questions and discussion
Seventh	2	Magnetic particle testing (MT(	Magnetic particle testing (MT(	theoretical	Questions and discussion
Eighth	2	Eddy Current Testing	Eddy Current Testing	theoretical	Questions and discussion
Ninth	2	Ultrasonic Inspection	Ultrasonic Inspection	theoretical	Questions and discussion
Tenth	2	Ultrasonic Inspection	Ultrasonic Inspection	theoretical	Questions and discussion
Eleventh	2	Radiography	Radiography	theoretical	Questions and discussion
Twelfth	2	Radiography	Radiography	theoretical	Questions and discussion
Thirteenth	2	Thermography	Thermography	theoretical	Questions and discussion
Fourteenth	2	Thermography	Thermography	theoretical	Questions and discussion
Fifteenth	2	Thermocouple	Thermocouple	theoretical	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	**References:** **1- "NON-DESTRUCTIVE TESTING" by BARRY HULL and VERNON JOHN (1988).** **2- "HANDBOOK OF NONDESTRUCTIVE EVALUATION" by Charles J. Hellier t (2003).** **3- "Non-Destructive Testing Techniques" by RAVI PRAKASH (2012).**
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides recognition of the basic principles of materials science necessary to explain and solve engineering problems by identifying and diagnosing defects and the possibility of solving the problem and the issue in an engineering style based on engineering principles where the course allows to deal with the crystal structure of engineering materials and phase charts.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Welding and cutting MAE324

4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/ 3rd Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The objective of this course is to introduce students to fundamental area of mechanical design processes which enables students to focus on the study of design effecting factors, physical and mechanical properties of materials. These principals allow the students to assess what could be achieved through this course when they are identifying of design to solve problems in industries.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and interpret data. A3. An ability to identify, formulate, and solve engineering problems. A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
B. Subject-specific skills B1. The ability to design and select engineering materials for scientific and industrial applications. B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them. B3. Writing scientific reports, reading blueprints and analyzing engineering materials. B4. The ability to keep pace with developments in engineering materials and their properties.
Teaching and Learning Methods
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories. 5- Graduation projects. 6- Scientific visits. 7- Seminars held in the department. 8- Summer training.
Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Stress and strain analysis		theoretical	Questions and discussion
Second	3	Curve beam analysis		theoretical	Questions and discussion
Third	3	Static design		theoretical	Questions and discussion
Fourth	3	Static design		Theoretical + tutorial	Questions and discussion
Five	3	Fatigue design		Theoretical	Questions and discussion
Sixth	3	Fatigue design		Theoretical + tutorial	Questions and discussion
Seventh	3	Fatigue life design		Theoretical +	Questions and discussion
Eighth	3	Fatigue life design		Theoretical +	Questions and discussion

Ninth	3	Fatigue life design		Theoretical + tutorial	Questions and discussion
Tenth	3	Spring design		Theoretical + tutorial	Questions and discussion
Eleventh	3	Static loading spring design		Theoretical + tutorial	Questions and discussion
Twelfth	3	Static loading spring design		Theoretical + tutorial	Questions and discussion
Thirteenth	3	Fatigue loading spring design		Theoretical + tutorial	Questions and discussion
Fourteenth	3	Fatigue loading spring design		Theoretical + tutorial	Questions and discussion
Fifteenth	3	Fatigue loading spring design		Theoretical + tutorial	Questions and discussion

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	Mechanical Design , 11th edition by Shigly
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides identification of the physical properties of engineering materials and classification of these materials on the basis of these properties, as they are classified as electronic materials, magnetic materials, optical materials, materials for medical uses, knowledge of the uses of these materials and how to deal with them in practical applications, as well as knowledge of the calculations related to them.

1. Teaching Institution	University of Basrah
2. University Department/Centre	Department of Engineering of Materials
3. Course title/code	Advanced Materials MAE423
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2nd Semester/4th Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	2021

8. Aims of the Course

The main objective of this course is studying and providing necessary scientific information and description related to the basic and important physical properties and the extent to which these properties affect the behavior of materials when used in scientific and life applications and have a knowledge of the related calculations.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	٣	Ohm's Law and Electrical	Electronic Materials	Theoretical +	Questions and discussion

		Conductivity,		tutorial	
Second	٣	Band Structures of Solids Conductivity of Metals and Alloys	Electronic Materials	Theoretical + tutorial	Questions and discussion
Third	٣	Superconductivity Conductivity in Other Materials	Electronic Materials	Theoretical + tutorial	Questions and discussion
Fourth	٣	Semiconductors Applications of Semiconductors Insulators and Dielectric Properties	Electronic Materials	Theoretical + tutorial	Questions and discussion
Five	٣	Polarization in Dielectrics Electrostriction, Piezoelectricity, Pyroelectricity, and Ferroelectricity	Electronic Materials	Theoretical + tutorial	Questions and discussion+ Quiz
Sixth	٣	Classification of Magnetic Materials Magnetic Dipoles and Magnetic Moments	Magnetic Materials	Theoretical + tutorial	Questions and discussion
Seventh	٣	Magnetization, Permeability, and the Magnetic Field	Magnetic Materials	Theoretical + tutorial	Questions and discussion
Eighth	٣	Diamagnetic, Paramagnetic, Ferromagnetic, Ferrimagnetic, and Superparamagnetic Materials	Magnetic Materials	Theoretical + tutorial	Questions and discussion
Ninth	٣	Domain Structure and the Hysteresis Loop The Curie Temperature Applications of Magnetic Materials Metallic and Ceramic Magnetic Materials	Magnetic Materials	Theoretical + tutorial	Questions and discussion+ Quiz
Tenth	٣	The Electromagnetic Spectrum . Refraction, Reflection, Absorption, and Transmission	Photonic Materials	Theoretical + tutorial	Questions and discussion
Eleventh	٣	Selective Absorption, Transmission, or Reflection	Photonic Materials	Theoretical + tutorial	Questions and discussion
Twelfth	٣	Examples and Use of Emission Phenomena Fiber Optic Communication System ,	Photonic Materials	Theoretical + tutorial	Questions and discussion+ Quiz
Thirteenth	٣	Requirements for Biomaterials Dental Materials : Cavity Fillers , Bridges, Crowns and Dentures, Dental Implants ,	**Biomaterials**	Theoretical + tutorial	Questions and discussion
Fourteenth	٣	The Structure of Bone and Bone Fractures	**Biomaterials**	Theoretical +	Questions and discussion

		Replacement Joints : Hip Joints , Shoulder Joints, Knee Joints , Finger Joints and Hand Surgery		tutorial	
Fifteenth	٣	Reconstructive Surgery : Plastic Surgery, Maxillofacial Surgery , Ear Implants Biomaterials for Heart Repair : Heart Valves, Pacemakers, Artificial Arteries Tissue Repair and Growth Other Surgical Applications Ophthalmics Drug Delivery Systems	**Biomaterials**	Theoretical + tutorial	Questions and discussion+Quiz

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	The Science and Engineering of Materials 6th ed. Donald R. Askeland. Introduction-to-materials-science-shackelford. Phillips' Science of Dental Materials KENNETH J. ***ANUSAVICE, PhD, DMD***
B- Electronic references, websites	All available sites related to the subjects of the course.

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides knowledge of the basic principles of Computer Assisted Part Programming for Design and Manufacturing and how to take advantage of digital control (the use of computers) in the design, production and management of industrial and production processes

1. Teaching Institution	University of basrah
2. University Department/Centre	Department of engineering of Materials
3. Course title/code	Advanced Materials MAE415
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/4th Year
6. Number of hours tuition (total)	30 Hours
7. Date of production/revision of this	2021

8. Aims of the Course

The main objective of studying this course is to teach the student how to deal with and manage various industrial processes. The student is also provided with basic information for digital control, that is, using the computer in design and manufacturing processes, and also allows the student to learn how to write digital programs for automated industrial machines for production and manufacturing purposes.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Introduction to CAD/CAM	Introduction to CAD/CAM	Theoretical	Questions and discussion

		,			
Second	2	Groover and Hughes Model	Introduction to CAD/CAM	Theoretical	Questions and discussion
Third	2	The Product Cycle and CAD/CAM	Introduction to CAD/CAM	Theoretical	Questions and discussion
Fourth	2	Automation and CAD/CAM	Introduction to CAD/CAM	Theoretical	Questions and discussion+ Quiz
Five	2	Numerical Control	Numerical Control	Theoretical	Questions and discussion
Sixth	2	NC Part Programming Manual Part Programming	Numerical Control	Theoretical	Questions and discussion
Seventh	2	Computer-Assisted Part Programming	Numerical Control	Theoretical	Questions and discussion+ Quiz
Eighth	2	Part programming languages The APT Language Geometry statements	Part programming languages	Theoretical	Questions and discussion
Ninth	2	Examples on geometry Statements	Part programming languages	Theoretical	Questions and discussion
Tenth	2	Motion statements	Part programming languages	Theoretical	Questions and discussion
Eleventh	2	Examples on Motion Statements	Part programming languages	Theoretical	Questions and discussion
Twelfth	2	Postprocessor statements Auxiliary statements	Part programming languages	Theoretical	Questions and discussion
Thirteenth	2	Examples on APT Language	Part programming languages	Theoretical	Questions and discussion
Fourteenth	2	The Macro-statements in APT	Part programming languages	Theoretical	Questions and discussion
Fifteenth	2	Examples on Macro-statements in APT	Part programming languages	Theoretical	Questions and discussion+ Quiz

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	COMPUTER AIDED DESIGN AND MANUFACTURING by Mikell P. Groover and Emory W. Zimmers Jr., Printice Hall of India Private Limited
B- Electronic references, websites	All available sites related to the subjects of the course.

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The course provides an introduction to the practical application of three theoretical subjects, namely, nondestructive testing, powder metallurgy, automation, and mechanization. A cause-and-effect diagram is used to identify and evaluate the practical results of these experiments and to support theoretical teaching allowing the student to observe and evaluate laboratory results. Practical experiments are conducted in accordance with safety regulations and instructions in order to teach students to follow the correct procedures during conducting practical experiments and to ensure the safety of students and laboratory workers.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Failure of Engineering Materials MAE322
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	1st Semester/ 4th Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The main objective of this course is to teach students and provide basic information related to conducting practical experiments related to the subject matter of Lamer Tests, Powder Metallurgy, Automation and Mechanization.	

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. An ability to apply knowledge of mathematics, science, and engineering A2. An ability to design and conduct experiments, as well as to analyze and

interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

C2. Response: Follow up the student's interaction with the material displayed on the screen

C3. Attention: Follow up on the interest of the student who interacted the most with the presented material.

C4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

C5. Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so he has a constant level in the lesson and does not let up or get bored.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.

D3. Developing the student's ability to deal with multiple means.

D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Liquid Penetrant Testing** **Test method for sieve analysis and shape examination of material powders** **Studying the experimental error**	Practical	Questions, discussion and write report
Second	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Liquid Penetrant Testing** **Test method for sieve analysis and shape examination of material powders** **Studying the experimental error**	Practical	Questions, discussion and write report
Third	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Liquid Penetrant Testing** **Test method for sieve analysis and shape examination of material powders** **Studying the experimental error**	Practical	Questions, discussion and write report
Fourth	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Coating Thickness Measurement** **Fabrication of green compaction in uniaxial pressing** **Studying the experimental error**	Practical	Questions, discussion and write report
Five	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Coating Thickness Measurement** **Fabrication of green compaction in uniaxial pressing** **Studying the experimental error**	Practical	Questions, discussion and write report
Sixth	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Coating Thickness Measurement** **Fabrication of green compaction in uniaxial pressing** **Calibration**	Practical	Questions, discussion and write report
Seventh	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**surface roughness measurement** **Fabrication of green compaction in uniaxial pressing** **Calibration**	Practical	Questions, discussion and write report
Eighth	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**surface roughness measurement** **Fabrication of green compaction in uniaxial pressing** **Calibration**	Practical	Questions, discussion and write report
Ninth	3	Non-destructive Tests + Powder Metallurgy +	**surface roughness measurement** **Fabrication of green compaction in**	Practical	Questions, discussion

		CAD& CAM	**uniaxial pressing** **Calibration**		and write report
Tenth	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Thickness Measurement** **Effect of compaction pressure on green density** **Calibration**	Practical	Questions, discussion and write report
Eleventh	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Thickness Measurement** **Effect of compaction pressure on green density** **Eccentricity and Runout errors**	Practical	Questions, discussion and write report
Twelfth	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Thickness Measurement** **Effect of compaction pressure on green density** **Eccentricity and Runout errors**	Practical	Questions, discussion and write report
Thirteenth	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Eddy Current Test** **Effect of compaction pressure on green density** **Eccentricity and Runout errors**	Practical	Questions, discussion and write report
Fourteenth	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Eddy Current Test** **Sintered the compact specimen in argon atmosphere Sintering** **Eccentricity and Runout errors**	Practical	Questions, discussion and write report
Fifteenth	3	Non-destructive Tests + Powder Metallurgy + CAD& CAM	**Eddy Current Test** **Sintered the compact specimen in argon atmosphere Sintering** **Eccentricity and Runout errors**	Practical	Questions, discussion and write report

12. Infrastructure

1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	NON-DESTRUCTIVE TESTING" by BARRY HULL and VERNON JOHN (1988). 2- "HANDBOOK OF NONDESTRUCTIVE EVALUATION" by Charles J. Hellier t (2003). 3- "Non-Destructive Testing Techniques" by RAVI PRAKASH (2012). **Powder metallurgy technology; first published,2020,G.S.Upadhyaya** **powder metallurgy; by S.A. Tsukerman** **powder metallurgy processing and technology; Howard kuhn**
B- Electronic references, websites	

13. Course development plan

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

he course provides an introduction to the practical application of theoretical materials, namely X-ray examination, microscopy, design and selection of engineering materials and nanomaterials. The practical aspect is used to evaluate the practical results of these experiments and to support theoretical teaching, allowing the student to observe and evaluate laboratory results. Practical experiments are conducted according to safety regulations and instructions in order to teach students to follow the correct procedures during conducting practical experiments and to ensure the safety of students and laboratory workers.

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	laboratories MAE428
4. Modes of Attendance offered	Daily time + online
5. Semester/Year	2st Semester/ 4th Year
6. Number of hours tuition (total)	45 hrs
7. Date of production/revision of this	
8. Aims of the Course	
The main objective of this course is to teach students and provide basic information related to conducting practical experiments related to the subject matter of Lamer Tests, Powder Metallurgy, Automation and Mechanization.	

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. An ability to apply knowledge of mathematics, science, and engineering

A2. An ability to design and conduct experiments, as well as to analyze and interpret data.

A3. An ability to identify, formulate, and solve engineering problems.

A4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. Subject-specific skills

B1. The ability to select engineering materials for scientific and industrial applications.

B2. The ability to think about solving problems related to the use of engineering materials and methods of avoiding them.

B3. Writing scientific reports, reading blueprints and analyzing engineering materials.

B4. The ability to keep pace with developments in engineering materials and their properties.

Teaching and Learning Methods

1- Explanation and clarification through lectures.
2- Display scientific materials with projectors: data show, smart boards, plasma screens.
3- Self-learning through homework and mini-projects within the lectures.
4- Laboratories.
5- Graduation projects.
6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods

1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

C. Thinking Skills

C1. Attention: raising the students' attention by implementing one of the application programs on the display screen in the hall

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D1. Develop the student's ability to deal with technology.

D2. Developing the student's ability to deal with the Internet.
D3. Developing the student's ability to deal with multiple means.
D4. Develop the student's ability to dialogue and discussion.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	3	**XRD data analysis using X'pert HighScore software,fatige test,**	**Liquid Penetrant Testing Test method for sieve analysis and shape examination of material powders Studying the experimental error**	Practical	Questions, discussion and write report
Second	3	**SEM sample preparation techniques,creep test,**	**Liquid Penetrant Testing Test method for sieve analysis and shape examination of material powders Studying the experimental error**	Practical	Questions, discussion and write report
Third	3	**TEM sample preparation techniques,corrosion test,**	**Liquid Penetrant Testing Test method for sieve analysis and shape examination of material powders Studying the experimental error**	Practical	Questions, discussion and write report
Fourth	3	**XRD data analysis using X'pert HighScore software,wear test,**	**Coating Thickness Measurement Fabrication of green compaction in uniaxial pressing Studying the experimental error**	Practical	Questions, discussion and write report
Five	3	**XRD data analysis using X'pert HighScore software,fatige test,**	**Coating Thickness Measurement Fabrication of green compaction in uniaxial pressing Studying the experimental error**	Practical	Questions, discussion and write report
Sixth	3	**SEM sample preparation techniques,creep test,**	**Coating Thickness Measurement Fabrication of green compaction in uniaxial pressing Calibration**	Practical	Questions, discussion and write report
Seventh	3	**TEM sample preparation techniques,corrosion test,**	**surface roughness measurement Fabrication of green compaction in uniaxial pressing Calibration**	Practical	Questions, discussion and write report
Eighth	3	**XRD data analysis using X'pert HighScore software,wear test,**	**surface roughness measurement Fabrication of green compaction in uniaxial pressing Calibration**	Practical	Questions, discussion and write report
Ninth	3	**XRD data analysis using X'pert HighScore software,fatige test,**	**surface roughness measurement Fabrication of green compaction in uniaxial pressing Calibration**	Practical	Questions, discussion and write report
Tenth	3	**SEM sample preparation**	**Thickness Measurement Effect of compaction pressure on**	Practical	Questions, discussion

		techniques,creep test,	**green density Calibration**		and write report
Eleventh	3	**TEM sample preparation techniques,corrosion test,**	**Thickness Measurement Effect of compaction pressure on green density Eccentricity and Runout errors**	Practical	Questions, discussion and write report
Twelfth	3	**TEM sample preparation techniques**	**Thickness Measurement Effect of compaction pressure on green density Eccentricity and Runout errors**	Practical	Questions, discussion and write report
Thirteenth	3	**XRD data analysis using X'pert HighScore software,**	**Eddy Current Test Effect of compaction pressure on green density Eccentricity and Runout errors**	Practical	Questions, discussion and write report
Fourteenth	3	**SEM sample preparation techniques**	**Eddy Current Test Sintered the compact specimen in argon atmosphere Sintering Eccentricity and Runout errors**	Practical	Questions, discussion and write report
Fifteenth	3	**TEM sample preparation techniques**	**Eddy Current Test Sintered the compact specimen in argon atmosphere Sintering Eccentricity and Runout errors**	Practical	Questions, discussion and write report

12. Infrastructure	
1- Required reading: · Books · COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	References: 1- "Physical Principles of Electron Microscopy" by Ray F. Egerton (2005). 2- "Elements of X-Ray Diffraction" by B.D. Cullity S.R. Stock (2014).
B- Electronic references, websites	

13. Course development plan