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

University:-Basrah
College:-Engineering
Department-:Chemical engineering
Date of Form Completion:

Dean's Name	Dean's Assistant for Scientific Affairs	Head of Department
Prof..Dr.Ramzy Salim Ali	Assist.Prof.Dr.Haider Maath Mohammad	**Asist.Prof.Dr.Abdulwahid Al-Hajjaj**
Date: / /	Date: / /	Date: 30/05/2021
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	Chemical engineering Department
3. Program Title	Chemical engineering
4. Title of Final Award	Semester System
5. Modes of Attendance offered	Bachelor of Chemical Engineering
6. Accreditation	ABET
7. Other external influences	
8. Date of production/revision of this specification	2021
9. Aims of the Program	
1. Preparing chemical engineers with the best contemporary technology for industry and academic study	
2. Enable students to access and learn about the latest contemporary technologies for the chemical and petrochemical industries through the Internet	
3. Attempting to encourage postgraduate students to carry out joint research with supervisors from outside Iraq to get acquainted with the latest methods of equipment and publications to organize work	
4. Emphasizing on summer training for students in laboratories and making multiple visits by the teaching staff to students in laboratories and making sure of the ability of the other party to give the student an opportunity for field practice and practical benefit.	
5. Continuous evaluation of the curricula given to the student and the extent to which they keep pace with the rapid development in the world	

6. Serious interest in engineering projects and an attempt to involve a discussion member from the industry for which the project was designed
7. Developing the student's abilities in the academic field and in other scientific, technical, sports and creative fields
8. Instilling confidence in the student in the department, its leadership and faculty members, and trying to deter destructive and inappropriate ideas for the university community
9. Intensifying meetings with students and involving them in the evaluation of these stages, in addition to educational supervision and identifying their own problems.
10. Graduating qualified chemical engineers for academic work and life

10. Learning Outcomes, Teaching, Learning and Assessment Methods
A. Knowledge and Understanding A1. Necessary facts, concepts, principles and theories of physical chemistry A2. Understand the constraints facing the engineer in making the right decision A3. Basic Mathematics and Science A4. Techniques used A5- Chemical ideas and concepts
B. Subject-specific skills B1. Ethics and professionalism of the profession. B2 - The impact of engineering activities on society and civilization. B3 - Compatibility with future issues. B4 - Writing scientific reports, reading charts and analyzing data
Teaching and Learning Methods
1. Explanation and clarification through lectures 2. The method of displaying scientific materials on display devices: data show, smart boards, and 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. Quizzes (coz)
2. Homework
3. Quarterly exams for theoretical and practical subjects
4. Small projects within the lesson
5. Interaction within the lecture
6. Reports

C. Thinking Skills

C1. Attention: Arousing the students' attention by implementing one of the applied 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 more with the presented material, by increasing this interaction by requesting other programs and applications to display

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

C 5- Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so that he has a stable level in the lesson and does not become lazy or fidgety.

Teaching and Learning Methods

Assessment methods

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

D1. 1- Solve industrial problems that may be limited by known or unknown circumstances.

D2 - Analyzing and discussing the available data or conducting specific experiments to obtain more data.

D3 - Design units and processes and make the necessary improvements.

D4 - The ability to apply new technologies and possess a holistic view of industrial engineering problems and take Considering cost, safety, quality, environmental impacts, and the ability to assess and manage risks

Teaching and Learning Methods

Assessment Methods

• ctive participation in the classroom, a guide to student 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

11. Programme Structure				12. Awards and Credits
Level/Year	Course or Module Code	Course or Module Title	Credit rating	
Semester1/FIRST	U111	English Language I		Bachelor Degree Requires (x) credits
	E113	Computer		
	E112	Mathematics I		
		Physics		
	E112	Chemistry (Analytical Chemistry)		
	CHE115	Engineering Drawing		
	CHE116	Principles of Chemical Engineering I		

Semester2/FIRST	U121	Technical English II		
	E122	Mathematics II		
	E123	Physics		
	CHE124	Organic Chemistry		
	CHE125	Process flow sheeting		
	CHE126	Chemical Engineering Principles II		
Semester1/Second		Human Rights & Democracy		
		Applied Mathematics I		
		Fluid Mechanics I		
		Physical Chemistry		
		Electrical Technologies		
		Chemical Engineering Energy Balance		
		Engineering Statistics		
		Visual Basic		
Semester2/Second		Thermodynamics chemical engeneering		
		Applied Mathematics I I		
		Fluid Mechanics I I		
		Physical Chemistry I I		
		Fuel and Solar energy		
		Chemical Engineering Energy Balance		
		Matlab		
Semester1/Third		Chemical Eng. Analysis I		
		Heat Transfer I		
		Mass Transfer I		
		Chemical Eng. Thermodynamics II		
		Engineering Materials Properties		
		Chemical Industries		
		Water Technology		
Semester2/Third		Chemical Eng. Analysis I I		
		Heat Transfer I I		
		Mass Transfer I I		

		Economics engenureeing		
		Corrosion engeneering		
		Chemical Industries		
		Reactor design		
Semester1/Fourth		Engineering Project I		
		Unit Operation		
		Process Dynamics		
		Equipment Design I		
		Reactor design II		
		Petroleum Refinery I		
		Numerical Methods		
		اخلاقيات المهنة		
Semester1/Fourth		Engineering Project I		
		Transmission phenomena II		
		Process Dynamics		
		Equipment Design I		
		Reactor design II		
		Petroleum Refinery II		
		Numerical Methods II		

13. Personal Development Planning
14. Admission criteria
Average: not less than 90% Age: no more than 25 years old Number: about 75 students annually
15. Key sources of information about the programme
1. The websites of Iraqi and foreign universities 2. Workshops held by the Ministry of Higher Education in addition to the Ministry's standards

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**	**D1**	**D2**	**D3**	**D4**
Semester1/FIRST	U111	English Language I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	E113	Computer	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	E112	Mathematics Ⅰ	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	E112	Physics	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE115	Chemistry (Analytical Chemistry)	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE116	Engineering Drawing	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Semester2/FIRST	U121	Technical English II	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	E122	Mathematics Ⅱ	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	E123	Physics	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE124	Organic Chemistry	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE125	Process flow sheeting	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE126	Chemical Engineering	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

		Principles II																	
	U121	Technical English II	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Semester1/Second	CHE201	Human Rights & Democracy	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE202	Applied Mathematics I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE203	Fluid Mechanics I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE204	Physical Chemistry	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE205	Electrical Technologies	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE202	Chemical Engineering Energy Balance	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE201	Engineering Statistics	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE202	Visual Basic	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Semester2/Second	CHE201	Thermodynamics chemical engeneering	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE202	Applied Mathematics I I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE203	Fluid Mechanics I I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE204	Physical Chemistry I I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE205	Fuel and Solar energy	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE202	Chemical Engineering Energy Balance	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHE201	Matlab	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Semester1/Third		Chemical Eng. Analysis I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Heat Transfer I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Mass Transfer I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Chemical Eng. Thermodynamics II	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Engineering Materials Properties	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Chemical Industries	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Water Technology	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Semester2/Third		Chemical Eng. Analysis I I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Heat Transfer I I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Mass Transfer I I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Economics engenureeing	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Corrosion engeneering	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Chemical Industries	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Reactor design	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Semester1/Fourth		Engineering Project I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Unit Operation	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Process Dynamics	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Equipment Design I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Reactor design II	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

		Petroleum Refinery I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Numerical Methods	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		اخلاقيات المهنة	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Semester2/Fourth		Engineering Project I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Transmission phenomena II	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Process Dynamics	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Equipment Design I	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Reactor design II	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Petroleum Refinery II	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Numerical Methods II	essenial	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

EMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	University of Basrah
2. University Department/Centre	Chemical engineering department
3. Course title/code	Heat transfer 2 CHE322
4. Programme to which it contributes	
5. Modes of Attendance offered	
6. Semester/Year	
7. Number of hours tuition (total)	60
8. Date of production/revision of this specification	2021
9. Aims of the Course	

10· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. Necessary facts, concepts, principles and theories of thermal chemistry

A2. Understand the constraints facing the engineer in making the right decision

A3. Basic Mathematics and Science

A4. Techniques used

A5- Chemical ideas and concepts

B. Subject-specific skills

B1. Ethics and professionalism of the profession.

B2 - The impact of engineering activities on society and civilization.

B3 - Compatibility with future issues.

B4 - Writing scientific reports, reading charts and analyzing data

Teaching and Learning Methods

1. Explanation and clarification through lectures
2. The method of displaying scientific materials on display devices: data show, smart boards, and 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

Assessment methods

1. Quizzes
2. Homework
3. Quarterly exams for theoretical and practical subjects
4. Small projects within the lesson
5. Interaction within the lecture
6. Reports

C. Thinking Skills

C1. Attention: Arousing the students' attention by implementing one of the applied 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 more with the presented material, by increasing this interaction by requesting other programs and applications to display

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

C 5- Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so that he has a stable level in the lesson and does not become

lazy or fidgety.

Teaching and Learning Methods

Assessment methods

• Active participation in the classroom, a guide to student 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.
D2.
D3.
D4.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4		Experimental relations of heat transfer by forced convection inside pipes		
2	4		low through cylindrical and spherical bodies, Flow through bundle of tubes		
3	4		condensation outside horizontal and vertical tube bank; Heat transfer to boiling liquid, Analysis of boiling curve, Nucleate boiling mechanism		
4	4		Heat Exchanger: Classification; Construction of shell and tube heat exchanger; LMTD, LMTD, NTU method		
5	4		correction factor, Dirt factor, Individual and overall heat transfer coefficient; Design procedure of shell and tube heat exchanger		
6	4		Radiation heat transfer: Introduction; Black body radiation, Plank’s		

			distribution law, Monochromatic emissive power		
7					

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	1- Hollman J.P., Heat Transfer, McGraw Hill 2. Kern D.Q., Process Heat Transfer, McGraw Hill
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	University of Basrah
2. University Department/Centre	Chemical engineering Department
3. Course title/code	Petroleum Refinery II **CHE427**
4. Programme to which it contributes	
5. Modes of Attendance offered	
6. Semester/Year	
7. Number of hours tuition (total)	60
8. Date of production/revision of this specification	2021
9. Aims of the Course	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1-Clarify the main concepts in the course. A2- Acquisition of skills in dealing with engineering problems and issues. A3- Acquisition of basic skills as an example in designing a chemical engineering model. A4- Gain a basic understanding of how engineering systems work in various industrial applications.
B. Subject-specific skills B1 - The ability to solve a complex mathematical model. B2 - The ability to think about addressing a particular problem or issue. B3 - Writing scientific reports. B4 - The ability to gain experience in dealing with engineering models
Teaching and Learning Methods
• Readings, self-learning, panel discussions. • Exercises and activities in the lecture. • Homework. • Directing students to some websites to benefit and develop capabilities. Conducting seminars to explain and analyze a specific issue and find solutions to it
Assessment methods
• Interaction within the lecture. • Homework and reports. • Short exams . Semester and final exams
C. Thinking Skills C1- Attention: Arousing the students' attention by implementing one of the practical issues in the lecture. C2 - Response: Follow up the student's interaction with the presented material. C 3- Attention: Follow up on the interest of the student who interacted more with the presented material, by increasing this interaction with an obligatory request. C4 - Forming the direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it. A 5- Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so that he has a stable level in the lesson and does not become lazy or fidgety.
Teaching and Learning Methods
Assessment methods

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

D1- Develop the student's ability to perform duties and deliver them on time

D 2- Logical and programmatic thinking to find software solutions to various problems

D 3- Develop the student's ability to dialogue and discussion

D4 - Develop the student's ability to deal with modern technology, especially the Internet

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4		Origin, formation and composition of petroleum. Evaluation of crude oils. Refinery products and their uses. Analysis of petroleum products. Fractionation of petroleum		
2	4		Thermal processes (cracking, coking, steam cracking) .		
3	4		Catalytic processes in oil refineries (catalytic cracking, hydro cracking, desulphurization by hydrogen		
4	4		reforming isomerization, polymerization , steam reforming)		
5	4		Lubricating oils (properties and needs, production techniques, removal of asphalt by solvents, extraction by furfural, de-waxing)		
6	4		Conventional chemical treatment of refinery products (treatment with sulfuric acid, treatment with earth) .		
7	4				

12. Infrastructure

Required reading: · CORE TEXTS · COURSE MATERIALS	1-Nelson, W.L., “Petroleum refining engineering”, McGraw-Hill Book Co . 2. Bhaskara Rao, B.K., Modern Petroleum Refining Processes”, Oxford-IBH Publishing Co

· OTHER	
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

EMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	ENGINEERING COLLEGE
2. University Department/Centre	BASRAH
3. Course title/code	FIRST/CHE116
4. Programme to which it contributes	
5. Modes of Attendance offered	
6. Semester/Year	2021
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	
9. Aims of the Course	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. A2. A3. A4. A5. A6.
B. Subject-specific skills B1. B2. B3.
Teaching and Learning Methods
Assessment methods
C. Thinking Skills C1. C2. C3. C4.
Teaching and Learning Methods
Assessment methods

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

D1.
D2.
D3.
D4.

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

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	ENGINEERING COLLEGE
2. University Department/Centre	BASRAH
3. Course title/code	FIRST/CHE116
4. Programme to which it contributes	
5. Modes of Attendance offered	
6. Semester/Year	2021
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	
9. Aims of the Course	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. A2. A3. A4. A5. A6.
B. Subject-specific skills B1. B2. B3.
Teaching and Learning Methods
Assessment methods
C. Thinking Skills C1. C2. C3. C4.
Teaching and Learning Methods
Assessment methods
D. General and Transferable Skills (other skills relevant to employability and personal development) D1. D2. D3. D4.

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

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

EMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	ENGINEERING COLLEGE
2. University Department/Centre	BASRAH
3. Course title/code	FIRST/CHE116
4. Programme to which it contributes	
5. Modes of Attendance offered	
6. Semester/Year	2021
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	
9. Aims of the Course	
Teaching student how to use visual basic program for programming the application of chemical engineering	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. A2. A3. A4. A5. A6.
B. Subject-specific skills B1. B2. B3.
Teaching and Learning Methods
Assessment methods
Home works
C. Thinking Skills C1. C2. C3. C4.
Teaching and Learning Methods
Assessment methods
D. General and Transferable Skills (other skills relevant to employability and personal development) D1. D2. D3.

D4.

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

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

EMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	ENGINEERING COLLEGE
2. University Department/Centre	BASRAH
3. Course title/code	FIRST/CHE116
4. Programme to which it contributes	
5. Modes of Attendance offered	
6. Semester/Year	2021
7. Number of hours tuition (total)	60
8. Date of production/revision of this specification	
9. Aims of the Course	
Learning about control units in pilot plants and how to control temperature and pressure	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. A2. A3. A4. A5. A6.
B. Subject-specific skills B1. B2. B3.
Teaching and Learning Methods
Assessment methods
Home works
C. Thinking Skills C1. C2. C3. C4.
Teaching and Learning Methods
Assessment methods
D. General and Transferable Skills (other skills relevant to employability and personal development) D1. D2. D3.

D4.

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4		Close loop	online	Home work
2	4		Controller type	online	Home work
3	4		Controller type	online	homework

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

EMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	University of Basrah
2. University Department/Centre	Chemical Engineering Department
3. Course title/code	Catalytic Reactor Design –CHE 425
4. Programme to which it contributes	
5. Modes of Attendance offered	Daily Attendance
6. Semester/Year	second semester/fourth year
7. Number of hours tuition (total)	60
8. Date of production/revision of this specification	2021
9. Aims of the Course	
Catalytic and non-catalytic reactors are ubiquitously found in chemical, biochemical and petrochemical industries for manufacturing variety of useful products. Effective design of such reactors for improved productivity requires detailed understanding of the underlying principles that govern their functioning. This second level course on chemical reaction engineering will extensively cover design of fluid-solid catalytic and non- catalytic reactors. Moreover, residence time distribution is an important aspect that is often used for various fault- diagnosis purposes. This course also covers various aspects of RTD and its applicability in designing non-ideal reactors. The material covered in this course will build on the basic topics of the first level chemical reaction engineering course.	

10· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1. develop technical criteria to define a reactor system of an industrial process from chemical data, biological, catalysis, mass and heat transfer and flow of matter and energy.

A2. To get knowledge of chemical reactors which work containing solid catalysts and to be able to design them.

A3. To get theoretical and numerical concepts of reactors working in several phases. Acquiring the ability to extrapolate the basis of mass transfer to other chemical engineering systems.

A4. To get basic and mathematic concepts of catalytic reactor design and their applications.

B. Subject-specific skills

B1. Knowledge of the mechanics and kinetics of catalytic reactions

B2. The ability to design catalytic reactors using mathematical models

B3. Evaluation of the performance and effectiveness of catalysts in industrial applications

Teaching and Learning Methods

B1- The ability to restore the effectiveness of the catalyst and activate it practically
B2 - Comparing the real performance of the catalysts and comparing them
B3 - The possibility of developing detailed explanations for the design of catalytic reactors.

Assessment methods

- Students' direct interaction in the classroom.
- Reports and homework
- quizzes.
- Semester and final exams

C. Thinking Skills

C1. Attention: Attracting the student's attention by solving mathematical models

C2- Response: Knowing how well the students responded to the presented material

C3 - Participation: the participation of students in concluding and proposing models and solutions to the presented problems

Teaching and Learning Methods

Assessment methods

Questions and discussion+Quiz

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

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4	Catalytical Reactions Steps:	Heterogeneous processes; Catalysis and adsorption	Theoretical	Questions and discussion
2	4	Catalysts and Catalysis	Classification and preparation of catalysts; Promoters and inhibitors,	Theoretical	Questions and discussion+Quiz
3	4	Catalytic Reactions Mechanism and Rate Equations	Rate equations of fluid-solid catalytic reactions; Hougen-Watson and power law models	Theoretical+ Tutorials	Questions and discussion+Quiz
4	4	Derive a Rate Law for Catalytic Reactions	Procurement and analysis of kinetic data;	Theoretical	Questions and discussion
5	4	Internal Diffusion Phenomena	Reaction and diffusion in porous catalysts.	Theoretical+ Tutorials	Questions and discussion+Quiz
6	4	Effectiveness Factor	Isothermal and non-isothermal effectiveness factors	Theoretical	Questions and discussion
7	4	Estimation of Diffusion- and Reaction-Limited Regimes	Effect of intra-phase transport	Theoretical+ Tutorials	Questions and discussion+Quiz
8	4	The Weisz–Prater criterion	effect of external mass transfer	Theoretical	Questions and discussion
9	4	The Overall Effectiveness Factor	Global reaction rate	Theoretical+ Tutorials	Questions and discussion+Quiz
10	4	Mears' Criterion for External Mass Transfer	Design of catalytic reactors	Theoretical	Questions and discussion
11	4	Fixed-bed Reactors Design	Isothermal and adiabatic fixed bed reactors	Theoretical+ Tutorials	Questions and discussion
12	4	Second Order Reaction in PBR	Multiphase reactor design	Theoretical	Questions and discussion
13	4	Catalyst Deactivation	Kinetics of catalyst Poisoning	Theoretical	Questions and discussion
14	4	Poisoning Fouling Sintering transformation	Kinetics of catalyst deactivation and regeneration	Theoretical	Questions and discussion+Quiz
15	4	Determination of Deactivation Kinetic Parameters	Determination of Deactivation Kinetic Parameters	Tutorials	Questions and discussion

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	1-Fogler, H.S. 1999. Elements of chemical reaction engineering. 3rd ed. Prentice-Hall. 2- Levenspiel, O. 1999. Chemical reaction engineering. 3rd ed. Wiley & Sons, Inc., 3-Froment, G.F.; Bischoff, K.B.; De Wilde, J. 2011. Chemical reactor analysis and design. 3rd ed. John Wiley & Sons, Inc.
Special requirements (include for example workshops, periodicals, IT software, websites)	www.cre.net
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	20
Maximum number of students	60

EMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Engineering material properties CHE315
4. Programme to which it contributes	Explanation and clarification through electronic lectures
5. Modes of Attendance offered	Explanation and clarification through electronic lectures
6. Semester/Year	First course /2021
7. Number of hours tuition (total)	2 therotical + 2 experimental (30 theoretical + 30 experimental)
8. Date of production/revision of this specification	1/6/2021
9. Aims of the Course	
The course aims to teach the student the principles of programming using the MATLAB language, as well as writing engineering programs, addressing and solving engineering problems and various mathematical applications using this language. As well as teaching the student how to write various engineers programs.	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. Necessary facts, concepts, principles and theories of physical chemistry A2. Understand the constraints facing the engineer in making the right decision A3. Basic Mathematics and Science A4. Techniques used A5- Chemical ideas and concepts
B. Subject-specific skills B1. Ethics and professionalism of the profession. B2 - The impact of engineering activities on society and civilization. B3 - Compatibility with future issues. B4 - Writing scientific reports, reading charts and analyzing data
Teaching and Learning Methods
1. Explanation and clarification through lectures 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures 4. Laboratories
Assessment methods
General and Transferable Skills (other skills relevant to employability and personal development), Solve industrial problems, Analyzing and discussing the available data or conducting specific experiments to obtain more data.,
C. Thinking Skills C1. Attention: Arousing the students’ attention by implementing one of the applied 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 more with the presented material, by increasing this interaction by requesting other programs and applications to display
Teaching and Learning Methods
. Explanation and clarification through lectures 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures 4. Laboratories
Assessment methods

General and Transferable Skills (other skills relevant to employability and personal development), Solve industrial problems, Analyzing and discussing the available data or conducting specific experiments to obtain more data.,

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

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

D1. 1- Solve industrial problems that may be limited by known or unknown circumstances.

D2 - Analyzing and discussing the available data or conducting specific experiments to obtain more data.

D3 - Design units and processes and make the necessary improvements.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Concepts, problems, expansions	Introduction in material properties	lecture + tutorial	active participation in the classroom, a guide to student commitment and responsibility
Second	2	Concepts, problems, expansions	Mechanical, physical and chemical material properties	lecture + tutorial	//
Third	2	Concepts, problems, expansions	Creep phoneme	lecture + tutorial	//
Four	2	Concepts, problems, expansions	Ceramic material	lecture + tutorial	//
Five	2	Concepts, problems, expansions	Polymer material	lecture + tutorial	//
Six	2	Concepts, problems, expansions	Crystalline structure	lecture + tutorial	//
Seven	2	Concepts, problems, expansions	Miller indies	lecture + tutorial	//
Eight	2	Concepts, problems, expansions	Defect in material structure	lecture + tutorial	//

Nine	2	Concepts, problems, expansions	Thermal equilibrium diagrams	lecture + tutorial	//
Ten	2	Concepts, problems, expansions	Bonds in material	lecture + tutorial	//
Eleven	2	Concepts, problems, expansions	Iron, copper, aluminum, zinc, lead	lecture + tutorial	//

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Material properties by hussain rahmat allah
Special requirements (include for example workshops, periodicals, IT software, websites)	Fundamentals of Materials Science and Engineering, 9 edition, William D. Callister, Jr.
Community-based facilities (include for example, guest Lectures, internship, field studies)	1- Polymer journal 2- Engineering material constriction

13. Admissions	
Pre-requisites	/
Minimum number of students	25
Maximum number of students	50

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	University of Basrah
2. University Department/Centre	Chemical engineering Department
3. Course title/code	Water technology
4. Programme to which it contributes	Semester System
5. Modes of Attendance offered	Bachelor of Chemical Engineering
6. Semester/Year	ABET
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	2020
9. Aims of the Course	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A. Knowledge and Understanding A1. Necessary facts, concepts, principles and theories of physical chemistry A2. Understand the constraints facing the engineer in making the right decision A3. Basic Mathematics and Science A4. Techniques used A5- Chemical ideas and concepts
B. Subject-specific skills B1. Ethics and professionalism of the profession. B2 - The impact of engineering activities on society and civilization. B3 - Compatibility with future issues. B4 - Writing scientific reports, reading charts and analyzing data
Teaching and Learning Methods
1. Explanation and clarification through lectures 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures 4. Laboratories
Assessment methods
1. Quizzes (coz) 2. Homework 3. Quarterly exams for theoretical and practical subjects 4. Small projects within the lesson 5. Interaction within the lecture 6. Reports
C. Thinking Skills C1. C2. C3. C4.
Teaching and Learning Methods
Assessment methods
C1. Attention: Arousing the students’ attention by implementing one of the applied 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 more with the presented material, by increasing this interaction by requesting other programs and applications to display

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

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

D1. 1- Solve industrial problems that may be limited by known or unknown circumstances.

D2 - Analyzing and discussing the available data or conducting specific experiments to obtain more data.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2		Water resources	Theoretical	Questions and discussion
2	2		Chemical properties of water	Theoretical	Questions and discussion
3	2		Physical properties of water	Theoretical	Questions and discussion
4	2		Chemical pollutants	Theoretical	Questions and discussion
5	2		Biological pollutants	Theoretical	Questions and discussion
6	2		Testing equipment's	Theoretical	Questions and discussion
7	2		Primary treatment	Theoretical	Questions and discussion
8	2		Secondary treatment	Theoretical	Questions and discussion
9	2		Chemical additives	Theoretical	Questions and discussion
10	2		Desalination methods	Theoretical	Questions and discussion
11	2		Calculation of thermal desalination methods	Theoretical	Questions and discussion
12	2		Calculation of reverse osmosis desalination method	Theoretical	Questions and discussion
13	2		Treatment of waste water	Theoretical	Questions and discussion
14	2		Chemical and biological properties of waste water	Theoretical	Questions and discussion
15	2		Steps of treatment of waste water	Theoretical	Questions and discussion
16	2		Testing and measuring equipment and	Theoretical	Questions and discussion

12. Infrastructure

Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	
Special requirements (include for example workshops, periodicals,	

IT software, websites)	
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

EMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	
2. University Department/Centre	
3. Course title/code	Engineering material properties CHE315
4. Programme to which it contributes	Explanation and clarification through electronic lectures
5. Modes of Attendance offered	Explanation and clarification through electronic lectures
6. Semester/Year	First course /2021
7. Number of hours tuition (total)	2 therotical + 2 experimental (30 theoretical + 30 experimental)
8. Date of production/revision of this specification	1/6/2021
9. Aims of the Course	
The course aims to introduce the student to the different types of engineering materials, as well as knowledge of their properties, composition, and practical and industrial applications, in addition to knowledge of the structure of alloys and different metals. As well as knowledge of methods of manufacturing engineering materials from raw materials and methods of chemical and thermal treatment. In addition to knowing the most important methods of examining engineering materials and studying them in practice in the laboratory	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. Necessary facts, concepts, principles and theories of physical chemistry A2. Understand the constraints facing the engineer in making the right decision A3. Basic Mathematics and Science A4. Techniques used A5- Chemical ideas and concepts
B. Subject-specific skills B1. Ethics and professionalism of the profession. B2 - The impact of engineering activities on society and civilization. B3 - Compatibility with future issues. B4 - Writing scientific reports, reading charts and analyzing data
Teaching and Learning Methods
1. Explanation and clarification through lectures 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures 4. Laboratories
Assessment methods
General and Transferable Skills (other skills relevant to employability and personal development), Solve industrial problems, Analyzing and discussing the available data or conducting specific experiments to obtain more data.,
C. Thinking Skills C1. Attention: Arousing the students’ attention by implementing one of the applied 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 more with the presented material, by increasing this interaction by requesting other programs and applications to display
Teaching and Learning Methods
. Explanation and clarification through lectures 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures 4. Laboratories

Assessment methods
General and Transferable Skills (other skills relevant to employability and personal development), Solve industrial problems, Analyzing and discussing the available data or conducting specific experiments to obtain more data.,
D. General and Transferable Skills (other skills relevant to employability and personal development) D. General and Transferable Skills (other skills relevant to employability and personal development) D1. 1- Solve industrial problems that may be limited by known or unknown circumstances. D2 - Analyzing and discussing the available data or conducting specific experiments to obtain more data. D3 - Design units and processes and make the necessary improvements.

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Concepts, problems, expansions	Introduction in material properties	lecture + experimental work + disscusion	active participation in the classroom, a guide to student commitment and responsibility
Second	2	Concepts, problems, expansions	Mechanical, physical and chemical material properties	//	//
Third	2	Concepts, problems, expansions	Creep phoneme	//	//
Four	2	Concepts, problems, expansions	Ceramic material	//	//
Five	2	Concepts, problems, expansions	Polymer material	//	//
Six	2	Concepts, problems, expansions	Crystalline structure	//	//
Seven	2	Concepts, problems, expansions	Miller indies	//	//

Eight	2	Concepts, problems, expansions	Defect in material structure	//	//
Nine	2	Concepts, problems, expansions	Thermal equilibrium diagrams	//	//
Ten	2	Concepts, problems, expansions	Bonds in material	//	//
Eleven	2	Concepts, problems, expansions	Iron, copper, aluminum, zinc, lead	//	//

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Material properties by hussain rahmat allah
Special requirements (include for example workshops, periodicals, IT software, websites)	Fundamentals of Materials Science and Engineering, 9 edition, William D. Callister, Jr.
Community-based facilities (include for example, guest Lectures, internship, field studies)	1- Polymer journal 2- Engineering material constriction

13. Admissions	
Pre-requisites	
Minimum number of students	25
Maximum number of students	50

EMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The student will learn different numerical methods and how to use them in the solution, as well as the difference between mathematical methods and numerical methods and their applications in Chemical Engineering problems.

1. Teaching Institution	University of Basrah
2. University Department/Centre	Chemical Engineering Department
3. Course title/code	Numerical methods/ CHE417
4. Programme to which it contributes	Chemical Engineering
5. Modes of Attendance offered	Daily attendance
6. Semester/Year	1st semester / fourth year
7. Number of hours tuition (total)	60
8. Date of production/revision of this specification	2021
9. Aims of the Course	
Using the numerical methods professionally in chemical engineering practical issues.	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1- Clarify the main concepts in the course. A2- Gain a basic understanding for applying numerical methods in practical issues.
B. Subject-specific skills B1- The ability to think and solve particular problem or issue. B2 - The ability to gain experience in applying numerical methods.
Teaching and Learning Methods
• Homework. • providing students with some good websites
Assessment methods
• Interaction within the lecture. • Homework and reports. • Short exams (Kuzat). • Semester and final exams
C. Thinking Skills Attracting the student's attention by providing examples that combine more than one specialty in one example, for the purpose of motivating the student to search for similar examples.
D. General and Transferable Skills (other skills relevant to employability and personal development) D1- Develop the student's ability to perform the duties and deliver them on time D2 - Develop the student's ability to dialogue and discussion D3- Develop the student's ability to deal with modern technology, especially the Internet

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
One	4	Solution of Non linear equations	Bisection method, Newton-Raphson method, Secant method,	Theoretical	Discussion
Two	4	Solution of Non linear equations	Modified Newton-Raphson method for multiple roots, Finding of multiple roots of a polynomial, Solution of a set of non-linear equations	Theoretical + Tutorial	Discussion
Three	4	Solution of Non linear equations	Application in thermodynamic property calculation, bubble point and dew	Theoretical	Discussion and Kuzat

			point calculation.		
Four	4	Solution of simultaneous linear equations	Gauss elimination Method, Gauss-Jordon Method	Theoretical + Tutorial	Discussion
Five	4	Solution of simultaneous linear equations	Iterative method - Jacobi iteration, Gauss-Seidel Method. SOR method,	Theoretical	Discussion
Six	4	Solution of simultaneous linear equations	Application in chemical engineering example	Theoretical + Tutorial	Discussion and Kuzat
Seven	4	Numerical Solution of ODE	Euler's Method, Euler's 2nd and fourth order methods	Theoretical	Discussion
Eight	4	Numerical Solution of ODE	Implicit Euler	Theoretical	Discussion and Kuzat
Nine	4	Numerical differentiation and integration	Taylo's series Runge-Kutta Method (2^{nd})	Theoretical + Tutorial	Discussion
Ten	4	Numerical differentiation and integration	Runge-Kutta Method (3^{rd}, 4^{th})	Theoretical	Discussion
Eleven	4	Numerical differentiation and integration	Heun' method	Theoretical	Discussion
Twelve	4	Numerical differentiation and integration	Finite Difference method	Theoretical + Tutorial	Discussion
Thirteen	4	Numerical differentiation and integration	Stability analysis of ODES method	Theoretical	Discussion and Kuzat
Fourteen	4	Interpolation	Lagrange method, Newton Divided Difference	Theoretical	Discussion
Fifteen	4	Discussion and revision	Discussion and revision	Theoretical + Tutorial	Discussion

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Numerical Methods and Modeling for Chemical Engineers by Davis M. E.
Special requirements (include for example workshops, periodicals, IT software, websites)	www.mathforcollege.com
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	

Minimum number of students	
Maximum number of students	

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	University of Basrah
2. University Department/Centre	Chemical engineering Department
3. Course title/code	Transport phenomena
4. Programme to which it contributes	Semester System
5. Modes of Attendance offered	Bachelor of Chemical Engineering
6. Semester/Year	ABET
7. Number of hours tuition (total)	60
8. Date of production/revision of this specification	2020
9. Aims of the Course	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A. Knowledge and Understanding A1. Necessary facts, concepts, principles and theories of physical chemistry A2. Understand the constraints facing the engineer in making the right decision A3. Basic Mathematics and Science A4. Techniques used A5- Chemical ideas and concepts
B. Subject-specific skills B1. Ethics and professionalism of the profession. B2 - The impact of engineering activities on society and civilization. B3 - Compatibility with future issues. B4 - Writing scientific reports, reading charts and analyzing data
Teaching and Learning Methods
1. Explanation and clarification through lectures 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures 4. Laboratories
Assessment methods
1. Quizzes (coz) 2. Homework 3. Quarterly exams for theoretical and practical subjects 4. Small projects within the lesson 5. Interaction within the lecture 6. Reports
C. Thinking Skills C1. C2. C3. C4.
Teaching and Learning Methods
Assessment methods
C1. Attention: Arousing the students’ attention by implementing one of the applied 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 more with the presented material, by increasing this interaction by requesting other programs and applications to display

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

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

D1. 1- Solve industrial problems that may be limited by known or unknown circumstances.

D2 - Analyzing and discussing the available data or conducting specific experiments to obtain more data.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4		Momentum equation	Theoretical	Questions and discussion
2	4		Steady-state momentum balance over the element	Theoretical	Questions and discussion
3	4		The streamline portion of the boundary layer	Theoretical	Questions and discussion
4	4		laminar and turbulent boundary layer	Theoretical	Questions and discussion
5	4		Boundary layer theory applied to pipe flow	Theoretical	Questions and discussion
6	4		boundary layer for heat transfer	Theoretical	Questions and discussion
7	4		Heat transfer for streamline flow over a plane surface	Theoretical	Questions and discussion
8	4		boundary layer for mass transfer	Theoretical	Questions and discussion
9	4		boundary layer for heat transfer	Theoretical	Questions and discussion
10	4		Reynolds analogy	Theoretical	Questions and discussion
11	4		Simple form of analogy between momentum, heat and mass transfer	Theoretical	Questions and discussion
12	4		Application of the boundary-layer theory	Theoretical	Questions and discussion
13	4		drying processes	Theoretical	Questions and discussion
14	4		humidification and de-humidification processes	Theoretical	Questions and discussion

12. Infrastructure

Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	
Special requirements (include for example workshops, periodicals, IT software, websites)	

Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

The student will learn different optimization and simulation methods and how to use them in the solution, as well as their applications in Chemical Engineering problems.

1. Teaching Institution	University of Basrah
2. University Department/Centre	Chemical Engineering Department
3. Course title/code	Optimization and Simulation / CHE428
4. Programme to which it contributes	Chemical Engineering
5. Modes of Attendance offered	Daily attendance
6. Semester/Year	2nd semester / Fourth year
7. Number of hours tuition (total)	60
8. Date of production/revision of this specification	2021
9. Aims of the Course	
Using the Optimization and Simulation methods professionally in chemical engineering practical issues.	

10· Learning Outcomes, Teaching, Learning and Assessment Method

A- Knowledge and Understanding

A1- Clarify the main concepts in the course.

A2- Gain a basic understanding for applying optimization methods in practical issues.

B. Subject-specific skills

B1- The ability to think and solve particular problem or issue.

B2- The ability to gain experience in applying optimization methods.

Teaching and Learning Methods

- Homework.
- providing students with some good websites

Assessment methods

- Interaction within the lecture.
- Homework and reports.
- Short exams (Kuzat).
- Semester and final exams

C. Thinking Skills

Attracting the student's attention by providing examples that combine more than one specialty in one example, for the purpose of motivating the student to search for similar examples.

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

D1- Develop the student's ability to perform the duties and deliver them on time

D2 - Develop the student's ability to dialogue and discussion

D3- Develop the student's ability to deal with modern technology, especially the Internet

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
One	4	Introduction	Nature and organization of optimization problems	Theoretical	Discussion
Two	4	Introduction	formulation of optimization problems	Theoretical + Tutorial	Discussion
Three	4	Introduction	optimum in single and multi-variable unconstrained and constrained problem	Theoretical	Discussion and
Four	4	Optimization Techniques	Graphical Method - Simplex method - duality - dual simplex method	Theoretical + Tutorial	Discussion

Five	4	Optimization Techniques	Lagrange multipliers and Kuhn-Tucker conditions - quadratic programming problem	Theoretical	Discussion and Kuzat
Six	4	Numerical methods for unconstrained functions	one dimensional search - gradient-free search with fixed step size - gradient search with acceleration	Theoretical + Tutorial	Discussion
Seven	4	Numerical methods for unconstrained functions	Newton's method - Quasi-Newton method - dichotomous search - fibonacci search - golden-section method	Theoretical	Discussion
Eight	4	Numerical methods for unconstrained functions	univariate search - simplex method - Powell's method - method of steepest descent - Fletcher-Reeves conjugate	Theoretical	Discussion and Kuzat
Nine	4	Classification of mathematical models	Fundamental features of models. General methods of solution	Theoretical + Tutorial	Discussion
Ten	4	Application to problems in staged operations	fluid mechanics, heat transfer and reactor design.	Theoretical	Discussion
Eleven	4	Dynamic Simulations	Batch reactor, Gravity flow tank, Three CSTR in series, Non-isothermal CSTR	Theoretical	Discussion
Twelve	4	Dynamic Simulations	Modeling and simulation of isothermal and non-isothermal operation of batch reactor	Theoretical + Tutorial	Discussion
Thirteen	4	Dynamic Simulations	isothermal and non isothermal CSTR and Semi-batch reactor	Theoretical	Discussion and Kuzat
Fourteen	4	Discussion and revision	Discussion and revision	Theoretical	Discussion
Fifteen	4	Discussion and revision	Discussion and revision	Theoretical + Tutorial	Discussion and Kuzat

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	"Process Modeling Simulation and Control for Chemical Engineers" by Luyben W. L. "Optimization of Chemical Processes" by Luyben W. L.
Special requirements (include for example workshops, periodicals, IT software, websites)	www.mathforcollege.com
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	Basrah university, college of engineering
2. University Department/Centre	Chemical engineering department
3. Course title/code	Engineering Corrosion CHE324
4. Programme to which it contributes	Explanation and clarification through electronic lectures
5. Modes of Attendance offered	Explanation and clarification through electronic lectures
6. Semester/Year	First course /2021
7. Number of hours tuition (total)	2 theoretical (30 theoretical)
8. Date of production/revision of this specification	1/6/2021
9. Aims of the Course	
The course aims to teach the student the subject of corrosion, as well as study its economic losses and the different types of losses it causes. As well as studying the different types of forms of erosion and methods of prevention and protection from it. As well as teaching the student the most important methods used in the examination of corrosion and methods of calculating annual corrosion rates for various engineering materials	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1. Necessary facts, concepts, principles and theories of physical chemistry A2. Understand the constraints facing the engineer in making the right decision A3. Basic Mathematics and Science A4. Techniques used A5- Chemical ideas and concepts
B. Subject-specific skills B1. Ethics and professionalism of the profession. B2 - The impact of engineering activities on society and civilization. B3 - Compatibility with future issues. B4 - Writing scientific reports, reading charts and analyzing data
Teaching and Learning Methods
1. Explanation and clarification through lectures 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures 4. Laboratories
Assessment methods
General and Transferable Skills (other skills relevant to employability and personal development), Solve industrial problems, Analyzing and discussing the available data or conducting specific experiments to obtain more data.,
C. Thinking Skills C1. Attention: Arousing the students’ attention by implementing one of the applied 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 more with the presented material, by increasing this interaction by requesting other programs and applications to display
Teaching and Learning Methods
1. Explanation and clarification through lectures 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures
Assessment methods

General and Transferable Skills (other skills relevant to employability and personal development), Solve industrial problems, Analyzing and discussing the available data or conducting specific experiments to obtain more data.,
D. General and Transferable Skills (other skills relevant to employability and personal development) D. General and Transferable Skills (other skills relevant to employability and personal development) D1. Solve industrial problems that may be limited by known or unknown circumstances. D2 - Analyzing and discussing the available data or conducting specific experiments to obtain more data. D3 - Design units and processes and make the necessary improvements.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First	2	Concepts, principles problems, expansions	Introduction in material properties	Lectures, discussion	active participation in the classroom, a guide to student commitment and responsibility
Second	2	Concepts, problems, expansions	Mechanical, physical and chemical material properties	//	//
Third	2	Concepts, problems, expansions	Creep phoneme	//	//
Four	2	Concepts, problems, expansions	Ceramic material	//	//
Five	2	Concepts, problems, expansions	Polymer material	//	//
Six	2	Concepts, problems, expansions	Crystalline structure	//	//
Seven	2	Concepts, problems, expansions	Miller indies	//	//
Eight	2	Concepts, problems,	Defect in material structure	//	//

		expansions			
Nine	2	Concepts, problems, expansions	Thermal equilibrium diagrams	//	//
Ten	2	Concepts, problems, expansions	Bonds in material	//	//
Eleven	2	Concepts, problems, expansions	Iron, copper, aluminum, zinc, lead	//	//

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Material properties by hussain rahmat allah
Special requirements (include for example workshops, periodicals, IT software, websites)	Fundamentals of Materials Science and Engineering, 9 edition, William D. Callister, Jr.
Community-based facilities (include for example, guest Lectures, internship, field studies)	https://www.sanfoundry.com/applied-chemistry-questions-answers-types-corrosion-passivity/

13. Admissions	
Pre-requisites	
Minimum number of students	25
Maximum number of students	50

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	University of Basrah
2. University Department/Centre	Chemical engineering Department
3. Course title/code	Unit operations
4. Programme to which it contributes	Semester System
5. Modes of Attendance offered	Bachelor of Chemical Engineering
6. Semester/Year	ABET
7. Number of hours tuition (total)	90(60 theo+30pract)
8. Date of production/revision of this specification	2020
9. Aims of the Course	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A. Knowledge and Understanding A1. Necessary facts, concepts, principles and theories of physical chemistry A2. Understand the constraints facing the engineer in making the right decision A3. Basic Mathematics and Science A4. Techniques used A5- Chemical ideas and concepts
B. Subject-specific skills B1. Ethics and professionalism of the profession. B2 - The impact of engineering activities on society and civilization. B3 - Compatibility with future issues. B4 - Writing scientific reports, reading charts and analyzing data
Teaching and Learning Methods
1. Explanation and clarification through lectures 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures 4. Laboratories
Assessment methods
1. Quizzes (coz) 2. Homework 3. Quarterly exams for theoretical and practical subjects 4. Small projects within the lesson 5. Interaction within the lecture 6. Reports
C. Thinking Skills C1. C2. C3. C4.
Teaching and Learning Methods
Assessment methods
C1. Attention: Arousing the students’ attention by implementing one of the applied 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 more with the presented material, by increasing this interaction by requesting other programs and applications to display

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

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

D1. 1- Solve industrial problems that may be limited by known or unknown circumstances.

D2 - Analyzing and discussing the available data or conducting specific experiments to obtain more data.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4+2		Filtration processes	Theoretical+ practical	Questions and discussion
2	4+2		Filter press	Theoretical+ practical	Questions and discussion
3	4+2		Filter drum	Theoretical+ practical	Questions and discussion
4	4+2		Centrifuge processes	Theoretical+ practical	Questions and discussion
5	4+2		Calculation of centrifuge processes	Theoretical+ practical	Questions and discussion
6	4+2		Fluid flow through packed columns	Theoretical+ practical	Questions and discussion
7	4+2		Calculation of fluid flow through packed columns	Theoretical+ practical	Questions and discussion
8	4+2		Types of packed columns	Theoretical+ practical	Questions and discussion
9	4+2		Mixing processes	Theoretical+ practical	Questions and discussion
10	4+2		Applications of mixing processes	Theoretical+ practical	Questions and discussion
11	4+2		Calculations of mixing processes	Theoretical+ practical	Questions and discussion
12	4+2		Sedimentation processes	Theoretical+ practical	Questions and discussion
13	4+2		Calculation of sedimentation processes	Theoretical+ practical	Questions and discussion
14	4+2		ہparticles mechanics	Theoretical+ practical	Questions and discussion

12. Infrastructure

Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures, internship, field	

studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	University of Basrah
2. University Department/Centre	Chemical engineering Department
3. Course title/code	Chemical Eng. Analysis II **CHE321**
4. Programme to which it contributes	
5. Modes of Attendance offered	
6. Semester/Year	
7. Number of hours tuition (total)	60
8. Date of production/revision of this specification	2021
9. Aims of the Course The development of new processes in the chemical industry is becoming more complex and increasingly expensive. If the research and development of the process can be carried out with confidence, the ultimate design will be more exact, and therefore the plant will operate more economically. In all facets of such a project, mathematics, which is the language of the quantitative, plays a vital role. Therefore training in mathematical methods is of the utmost importance to chemical engineers	

10· Learning Outcomes, Teaching, Learning and Assessment Method

A1-Clarify the main concepts in the course.

A2- Acquisition of skills in dealing with engineering problems and issues.

A3- Acquisition of basic skills as an example in designing a chemical engineering model.

A4- Gain a basic understanding of how engineering systems work in various industrial applications.

B. Subject-specific skills

B1 - The ability to solve a complex mathematical model.

B2 - The ability to think about addressing a particular problem or issue.

B3 - Writing scientific reports.

B4 - The ability to gain experience in dealing with engineering models

Teaching and Learning Methods

• Readings, self-learning, panel discussions.
• Exercises and activities in the lecture.
• Homework.
• Directing students to some websites to benefit and develop capabilities.
Conducting seminars to explain and analyze a specific issue and find solutions to it

Assessment methods

• Interaction within the lecture.
• Homework and reports.
• Short exams (Kuzat).
Semester and final exams

C. Thinking Skills

C1- Attention: Arousing the students' attention by implementing one of the practical issues in the lecture.

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

C 3- Attention: Follow up on the interest of the student who interacted more with the presented material, by increasing this interaction with an obligatory request.

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

A 5- Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so that he has a stable level in the lesson and does not become lazy or fidgety.

Teaching and Learning Methods

Assessment methods

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

D1- Develop the student's ability to perform duties and deliver them on time

D 2- Logical and programmatic thinking to find software solutions to various

problems
D 3- Develop the student's ability to dialogue and discussion
D4 - Develop the student's ability to deal with modern technology, especially the Internet

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4		Mathematical modeling (application on chemical engineering steady state and unsteady state systems).		
2	4		Error, Gamma, beta, and Bell functions		
3	4		Fourier Transform: Definition and properties. Fourier Integral, the limit of Fourier series, Inverse Fourier Transform.		
4	4		Finite differences (application on chemical engineering systems with multiple steps).		

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Jenson and Jeffery, Mathematical Methods in Chemical Engineering, 2. Mickley, Reid and Sherwood, Applied Mathematics in Chemical Engineering, Tata-

	McGraw-Hill.
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

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

1. Teaching Institution	University of Basrah
2. University Department/Centre	Chemical Engineering Department
3. Course title/code	Chemical Engineering Principles II CHE126
4. Programme to which it contributes	
5. Modes of Attendance offered	
6. Semester/Year	Semester2/FIRST
7. Number of hours tuition (total)	60
8. Date of production/revision of this specification	2021
9. Aims of the Course This course is intended to serve as an introduction to the principles and techniques used in the field of chemical engineering. Al though the range of subjects deemed to be in the province of "chemical engineering" has broadened over the last decade, the basic principles involved in chemical engineering remain the same. This course lays a foundation of certain information and skills that can be repeatedly employed in subsequent courses as well as in professional life	

10· Learning Outcomes, Teaching, Learning and Assessment Method
A- Knowledge and Understanding A1- Clarify the main concepts in the course. A2- Acquisition of skills in dealing with engineering problems and issues. A3- Acquiring basic skills as an introduction to designing a chemical engineering model. A4- Gain a basic understanding of how engineering systems work in various industrial applications.
B. Subject-specific skills B1 - The ability to understand the principles of chemical engineering. B2 - The ability to think about addressing a particular problem or issue. B3 - Writing scientific reports. B4 - The ability to acquire experience in dealing with the equilibrium of matter and properties of gases.
Teaching and Learning Methods
Readings, self-learning, panel discussions. • Exercises and activities in the lecture. • Homework. • Directing students to some websites to benefit and develop capabilities. Conducting seminars to explain and analyze a specific issue and find solutions to it
Assessment methods
• Interaction within the lecture. • Homework and reports. • Short exams (Kuzat). Semester and final exams
C. Thinking Skills A1- Attention: Arousing the students' attention by implementing one of the practical issues in the lecture. C2 - Response: Follow up the student's interaction with the presented material. C 3- Attention: Follow up on the interest of the student who interacted more with the presented material, by increasing this interaction with an obligatory request. C4 - Forming the direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it. A 5- Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so that he has a stable level in the lesson and does not become lazy or fidgety..

Teaching and Learning Methods
Assessment methods
D. General and Transferable Skills (other skills relevant to employability and personal development) D1- Develop the student's ability to perform the duties and deliver them on time D 2- Logical and programmatic thinking to find software solutions to various problems D 3- Develop the student's ability to dialogue and discussion D4 - Develop the student's ability to deal with modern technology, especially the Internet.

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4		Ideal gas, state equation if ideal gas, mixture of ideal gases.		
2	4		Real gases: pure & mixed with applications to material balances focus on *z* factors, introduce equations of state and trial & error solutions		
3	4		Vapor pressure: Antoine equation, Clausius-Clapeyron equation, and steam tables		
4	4		Mixture of gas and saturated		

			vapor		
5	4		Gas–Vapor Mixtures: relative saturation, relative humidity, dew point temperature, dew point pressure, condensation, saturation and drying problems		
6	4		Vapor–Liquid Equilibrium: Raoult's Law		

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Richard M. Felder Elementary principle of chem. Process David Humbllo Basic principles and calculation in chemical engineering
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	