University of Mosul

College of Petroleum and Mining Engineering

Department of Mining Engineering

Course Description

Third Stage/Annual System

Prof. Dr. Nabil Youssef Al-Banna

Head of the Scientific Committee

Asst. Prof. Dr. Azealdeen Salih Al-Jawadi

Head of Department

1. Course Name:
Transportation and trading of ore / Third stage
2. Course Code:
ME 311
3. Semester / Year:
Annual / 2024-2025
4. Description Preparation Date:
October 1, 2024
5. Available Attendance Forms:
In-person (On-campus)
6. Number of Credit Hours (Total) / Number of Units (Total)
57 hours / 2 Units
7. Course administrator's name (mention all, if more than one name)
Name: **Dr. Hudhaifa Raad Hamzah** **Email:** hudhaifahamzah@uomousl.edu.iq
8. Course Objectives

Course Objectives	1- Understand the importance of transport and circulation in the supply chain. 2- Identify various modes of transportation. 3- Analyze factors influencing transportation decisions. 4- Explore global supply chains by examining the complexities involved in international trade. 5- Investigate the role of technology in transportation and circulation.
9. Teaching and Learning Strategies	
Strategy	1- Lectures and Presentations: Conducting informative lectures and presentations can provide students with an overview of key concepts, theories, and principles related to transportation and circulation. 2- Interactive Discussions: Pose questions, encourage critical thinking, and facilitate debates to explore different perspectives. 3- Case Studies and Problem-Solving: Present real-life case studies that involve transportation and circulation issues. 4- Technology Integration: Utilize technology tools and resources to enhance the learning experience. 5- Assessment through Projects and Presentations: Design assessments that require students to demonstrate their understanding through projects or reports.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
The first	**1**	Understand basics of materials handling	**Introduction to Materials Handling I**	Theoretical	Explanation and discussion
The second	**2**	Describe material handling systems.	**Introduction to Materials Handling II**	Theoretical +discussion	Explanation and discussion
The third	**2**	Explain core principles of handling	**Principles of Materials Handling I**	Theoretical +discussion	Explanation and discussion
Fourth	**2**	Apply principles to simple scenarios	**Principles of Materials Handling II**	Theoretical +discussion	Explanation and discussion
Fifth	**2**	Define the unit load concept	**Unit Load Concept I**	Theoretical +discussion	Explanation and discussion
Sixth	**2**	Analyze unit load benefits	**Unit Load Concept II**	Theoretical +discussion	Explanation and discussion
Seventh	**2**	Identify handling equipment types	**Classification of Materials Handling Equipment I**	Theoretical +discussion	Explanation and discussion
The eighth	**2**	Classify common equipment	**Classification of Materials Handling Equipment II+ Quiz #1**	Theoretical +discussion	Explanation, discussion and exam
Ninth	**2**	Explain belt conveyor systems	**Belt Conveyors I**	Theoretical +discussion	Explanation and discussion
tenth	**2**	Analyze belt conveyor applications	**Belt Conveyors II + H.W. #1.**	Theoretical +discussion	Explanation, discussion, and written exercise
eleventh	**1**	Describe chain conveyor basics	**Chain Conveyors I**	Theoretical	Explanation and discussion
twelfth	**2**	Discuss chain conveyor types	**Chain Conveyors II**	Theoretical +discussion	Explanation and discussion
thirteenth	**2**	Examine haulage and cable systems	**Haulage and Cable Conveyors.**	Theoretical +discussion	Explanation and discussion
fourteenth	**2**	Compare bucket, roller, screw conveyors	**Bucket, Roller and Screw Conveyors.**	Theoretical +discussion	Explanation and discussion
fifteenth	**2**	Demonstrate overall concept integration	**Mid-term exam**	Theoretical	Exam
sixteenth	**2**	Understand pneumatic conveying	**Pneumatic Conveyors I**	Theoretical +discussion	Explanation and discussion
seventeenth	**2**	Evaluate pneumatic systems	**Pneumatic Conveyors II + Quiz # 2**	Theoretical +discussion	Explanation, discussion and exam
eighteenth	**2**	Explain hydraulic conveying	**Hydraulic Conveyors I**	Theoretical +discussion	Explanation and discussion
nineteenth	**2**	Assess hydraulic system uses	**Hydraulic Conveyors II + H.W. #2.**	Theoretical +discussion	Explanation, discussion, and written exercise
Twenty	**2**	Identify hoisting equipment	**Hoisting Equipment I**	Theoretical +discussion	Explanation and discussion
twenty-first	**2**	Explain hoisting operations	**Hoisting Equipment II**	Theoretical +discussion	Explanation and discussion
twenty-second	**2**	Analyze bulk handling equipment	**Bulk Handling Equipment and Systems I**	Theoretical +discussion	Explanation and discussion

twenty-third	**2**	Discuss bulk handling systems	**Bulk Handling Equipment and Systems II**	Theoretical +discussion	to explain and discussion
twenty-fourth	**2**	Understand robotic handling basics	**Robotic Handling, I**	Theoretical +discussion	Explanation and discussion
twenty-fifth	**2**	Apply robotic handling concepts	**Robotic Handling II + H.W. #3.**	Theoretical +discussion	Explanation, discussion, and written exercise
twenty-sixth	**1**	Describe piping system functions	**Piping System I**	theoretical	Monthly Exam
twenty-seventh	**2**	Explain piping components	**Piping System II**	Theoretical +discussion	Explanation and discussion
twenty-eighth	**2**	Evaluate safety and maintenance practices	**Organization, Maintenance and Safety**	Theoretical +discussion	Explanation and discussion
twenty-ninth	**2**	Present and discuss final reports	**Discuss reports**	Theoretical +discussion	Report presentation
thirty	**2**	Demonstrate comprehensive understanding	**Final Exam**	Theoretical	Final exam

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Not available
Main references (sources)	Ray, S. (2008). Introduction to materials handling.
Recommended books and references (scientific journals, reports…)	Fruchtbaum, J. Bulk Materials Handling Handbook.
Electronic References, Websites	Articles from the Internet

Name and signature of the department head

Dr. Azealdeen Salih Hassan

Name and signature of the course lecturer

Dr. Hudhaifa R. Hamzah

Course Description Form

1. Course name and academic level
Industrial Chemistry/ 3rd stage
2. Course code
ME 312
3.Semester/Year
Annual /2024 - 2025
4. Date this description was prepared
2\ 9 \2024
5. Available forms of attendance
In-person attendance
6.(Number of study hours (total) / Number of units (total .6
(120) hours / (6 Units)
7. Name of the course supervisor (if more than one name is mentioned) and academic title.
Name: Dr. Asmaa Alhasany Email: rosefirst78@uomosul.edu.iq
8.Course objectives

Course objectives	• Identify raw materials and their types (oil and minerals). • Explore the main units in petroleum facilities. • Gain knowledge about extraction, recovery, and purification methods.
9. Teaching and learning strategies	
Strategy	Lectures, discussions, class assignments, homework and reports

10. Course structure

week	watches	Required learning outcomes	Name of unit or topic	Learning method	Evaluation method
1	2		Course Introduction and Syllabus		
2	2	Define and describe Refining Processes	Introduction	Live lectures + discussion	Conduct an evaluation exam
3	2	List and label the Refinery Feedstocks and Products	Refinery Feedstocks and Products	Live lectures + discussion	Ask and discuss questions
4	2	List and describe the Products Composition	Products Composition	Live lectures + video presentations	Ask and discuss questions
5	2	Recognize the Physical Property Characterization Data	Physical Property Characterization Data	Live lectures + discussion	Conduct an evaluation exam
6	2	Understanding the Chemical Analysis Data	Chemical Analysis Data	Live lectures + discussion	Ask and discuss questions
7	2	Define and Describe	Crude Distillation Process Description	Live lectures +	Ask and discuss questions

		Crude Distillation Process		discussion	
8	**2**	List and describe the Operation of Crude Distillation Units	Operation of Crude Distillation Units	Live lectures + video presentations	Ask and discuss questions
9	**2**	Explain the steps of Crude Oil Desalting	Crude Oil Desalting	**Live lectures + discussion**	Ask and discuss questions
10	**2**	Explain Vacuum Distillation	Vacuum Distillation		
11	**2**	Recognize Crude Distillation Material Balance	Crude Distillation Material Balance	Live lectures + discussion	Ask and discuss questions
12	**2**	Explain How Using Process Simulators to Design of Crude Distillation Units	Design of Crude Distillation Units Using Process Simulators	Live lectures + video presentations	Ask and discuss questions
13	**2**	Explain Catalytic Reforming	Catalytic Reforming and Isomerization Catalytic Reforming	Live lectures + discussion	Ask and discuss questions
14	**2**	Explain the Isomerization of Light Naphtha	Isomerization of Light Naphtha		Conduct an evaluation exam
15	**2**		Exam	Live lectures + discussion	
16	**2**	Understanding the Role of FCC in the Refinery	Fluidised Catalytic Cracking Role of FCC in the Refinery	Live lectures + video presentations	Ask and discuss questions
17	**2**	List and describe the FCC Reactions	FCC Reactions	Live lectures + discussion	Ask and discuss questions
18	**2**				Conduct an evaluation exam
19	**2**	Understanding the Thermodynamics of FCC Reactions	Thermodynamics of FCC Reactions	Live lectures + discussion	Ask and discuss questions
20	**2**	Describe The Process Description	Process Description	Live lectures + video presentations	Conduct an evaluation exam
21	**2**	List Metals and describe The Extraction and Refining of Metals	Metals INTRODUCTION The Extraction and Refining of Metals	Live lectures + discussion	Ask and discuss questions
22	**2**	Explain the Primary Metal Production	Primary Metal Production		Ask and discuss questions
23	**2**	Describe the Hydrometallurgy of Copper	Hydrometallurgy of Copper	Live lectures + discussion	Conduct an evaluation exam
24	**2**	Explain the Primary Aluminum Production	Primary Aluminum Production	Live lectures + video presentations	
25	**2**	Explain the extraction of rare metals	extraction of rare metals	Live lectures + discussion	Ask and discuss questions
26	**2**		Exam		
27	**2**	List ENGINEERING MATERIALS	ENGINEERING MATERIALS	Live lectures + discussion	Conduct an evaluation

					exam
28	**2**	Explain the manufacturing and production of cement	Cement	Live lectures + video presentations	Ask and discuss questions
29	**2**	List and explain battery raw materials	battery raw materials	Live lectures + discussion	Conduct an evaluation exam
30	**2**		Exam		

Practical Part	
Week 1	Boiling Point Estimation
Week 2	Melting Point Estimation
Week 3	Viscosity Determination
Week 4	Acid Number Determination for Oil
Week 5	Flash Point Measurement
Week 6	Carbon Residue Determination of Petroleum Products by the Conradson Method
Week 7	Water and Sediment Determination by Centrifuge
Week 8	Water in Petroleum Products

11. Course Evaluation and Grade Divisions

First semester grade: 10 theoretical and 5 practical (exams and reports)
Midterm grade: 15 theoretical and 5 practical
Second semester grade: 10 theoretical and 5 practical (exams and reports)
Final exam: 40 theoretical and 10 practical.

12. Learning and teaching resources

Required textbooks (methodology if any)	Not available
Main References (Sources)	1. Fundamentals of Industrial Chemistry_ Pharmaceuticals, Polymers, and Business - PDF Room 2014 by John Wiley & Sons, Inc. All rights reserved 2. LOVk9FudkehCuKRXwoew 3. عملى كيمياء صناعية
Recommended supporting books and references (scientific (...journals, reports	Industrial Chemistry & Materials journal International Journal of Industrial Chemistry

Electronic references, websites	https://tech.chemistrydocs.com/Books/Applied%20-%20Industrial/Fundamentals-of-Industrial-Chemistry-Pharmaceuticals,-Polymers,-and-Business-by-John-A.-Tyrell.pdf https://www.google.com/search?client=opera&hs=Bkr&sca_esv=6fc066ba50ffeefd&q=تطبيقات+في+الكيمياء+الصناعية+pdf&sa=X&ved=2ahUKEwjgzL2d_7uNAxWs9rsIHXPZBzQQ1QJ6BAgkEAE&biw=1226&bih=552&dpr=1.5
Curriculum or description update rate	%10

Name and signature of the decision holder

Name and signature of the decision holder

Dr. Asmaa Alhasany

Course Description Form

1. Course Name:
Minerals processing/ third stage
2. Course Code:
ME313
3. Semester / Year:
Annual/ 2024-2025
4. Description Preparation Date:
15/ 9/2024
5. Available Attendance Forms:
In-person (On-campus)
6. Number of Credit Hours (Total) / Number of Units (Total)
150 hours / 8 unit
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Eman Kassim Yahya Email: eman.q@uomosul.edu.iq Name: Dr. Rahma Sael Abed Email: rahma.saeel86@uomosul.edu.iq
8. Course Objectives

Course Objectives	• Finished products perform one or both of two major functions: first, they form the material into the desired shape, and, second, they alter or improve the properties of the material. • Study the five important factors in the selection of raw material Qualities to consider when ordering raw materials that is include: Purity, Potency, Shelf life, Composition, Value. • Explain the step of processing of material from mine to product. • Study the equipment that used and system of processing material in plants. • Study the chemical and physical properties of raw material to choose the type of processing.

9. Teaching and Learning Strategies	
Strategy	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students, scientific trips to the plants, and prepare reports about raw materials and processing specially that riches in country.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Knowledge, Understanding, Comprehension	1. Properties of minerals & raw materials	**Theoretical + practical**	**Discussion**
2	5	Knowledge, Understanding, Comprehension	2. Terminology in minerals processing.	**Theoretical practical**	**Discussion**
3	5	Knowledge, Understanding, Comprehension	3. Mineral beneficiation operations	**Theoretical practical**	**Discussion**
4	5	Scientific Practical Skills	4. Sampling process	**Theoretical practical**	**Discussion**
5	5	Scientific Practical Skills	5. Sieve analyses	**Theoretical practical**	**Quiz**
6	5	Knowledge, Understanding, Comprehension	6. Types of Screens	**Theoretical practical**	**Discussion**
7	5	Scientific Practical Skills	7. Description of screening process	**Theoretical practical**	**Discussion**
8	5	Scientific Practical Skills	8. Screen Efficiency	**Theoretical practical**	**Home work**
9	5	Scientific Practical Skills	9. Grade of ore	**Theoretical practical**	**Discussion**
10	5	Scientific Practical Skills	10. Exam	**Theoretical practical**	**Exam**
11	5	Knowledge, Understanding, Comprehension	11. Liberation	**Theoretical practical**	**Discussion**
12	5	Knowledge, Understanding, Comprehension	12. Types of comminution operations	**Theoretical practical**	**Discussion**
13	5	Knowledge, Understanding, Comprehension	13. Crushing	**Theoretical practical**	**Discussion**
14	5	Knowledge, Understanding, Comprehension	14. Crushing Operation	**Theoretical practical**	**Discussion**
15	5	Knowledge, Understanding, Comprehension	15. Grinding	**Theoretical practical**	**Discussion**
16	5	Scientific Practical Skills	16. Exam	**Theoretical practical**	**Exam**
17	5	Knowledge, Understanding, Comprehension	17. Physical separation	**Theoretical practical**	**Discussion**
18	5	Knowledge, Understanding, Comprehension	18. Type of minerals particles settling	**Theoretical practical**	**Discussion**
19	5	Knowledge, Understanding, Comprehension	19. sizing classifier	**Theoretical practical**	**Discussion**
20	5	Scientific Practical Skills	20. sorting classifiers	**Theoretical practical**	**Quiz**

21	5	Knowledge, Understanding, Comprehension	21. centrifugal classifiers	**Theoretical practical**	**Discussion**
22	5	Knowledge, Understanding, Comprehension	22. hydrocyclone	**Theoretical practical**	**Discussion**
23	5	Scientific Practical Skills	23. Chemical separation+ flotation method	**Theoretical practical**	**Home work**
24	5	Knowledge, Understanding, Comprehension	24. leaching method	**Theoretical practical**	**Discussion**
25	5	Knowledge, Understanding, Comprehension	25. Magnetic separation	**Theoretical practical**	**Discussion**
26	5	Knowledge, Understanding, Comprehension	26. Electrical separation	**Theoretical practical**	**Discussion**
27	5	Scientific Practical Skills	27. Metallurgical balance	**Theoretical practical**	**Quiz**
28	5	Knowledge, Understanding, Comprehension	28. Contact angle in flotation.	**Theoretical practical**	**Discussion**
29	5	Knowledge, Understanding, Comprehension	29. application of mining processing	**Theoretical practical**	**Discussion**
30	5	Scientific Practical Skills	30. Exam	**Theoretical practical**	**Exam**

11. Course Evaluation

Midterm Exam: 20
Midterm Exam: 20
Daily Exams: 5
Reports: 5
Final Exam: 50

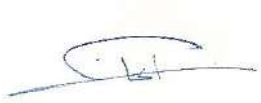
12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Not available
Main references (sources)	1- DRZYMALA, J., Mineral Processing Foundations of theory and practice of minerallurgy,2007,1st Ed., Wroclaw University of Technology, Oficyna Wydawnicza PWr., 2007,, 708 pp www.ig.pwr.wroc.pl/minproc. 2- Mineral Beneficiation A CONCISE BASIC COURSE, SUBBA RAO, D.V., 2011, S.D.S. Autonomous College Andhra Pradesh, India, Taylor & Francis Group press, 173 pp.
Recommended books and references (scientific journals, reports…)	1- GRINDING, TECHNICAL NOTES 8, R. P. King, 2000, 39p. 2- Flotation Froth Phase Bubble Size Measurement, Bhondayi, C., 2020, Institute for the Development of Energy for African Sustainability, University of South Africa, Florida, South Africa , Taylor & Francis Group, LLC , 23 p., https://doi.org/10.1080/08827508.2020.1854250.
Electronic References, Websites	1- www.rocscince.org

Name and signature of the department head

Dr. Azealdeen Salih Hassan

Name and signature of the course lecturer



Dr. Eman Kassim Yahya

Course Description Form

1. Course name and academic level
Well log/ 3rd stage
2. Course code
ME314
3.Semester/Year
Annual / 2024-2025
4. Date this description was prepared
2024\9\2
5. Available forms of attendance
In-person attendance
6.(Number of study hours (total) / Number of units (total .6
(120) hours / (4 Units)
7. Name of the course supervisor (if more than one name is mentioned) and academic title.
Name: Dr. Rahma Sael Al-Auqadi Email:Rahma.saeel86@uomosul.edu.iq
8.Course objectives

Course objectives	• Identify various well logging tools and their uses in determining reservoir petrophysical properties, including porosity, water saturation, and even permeability. • Provide information on the formation evaluation process and the techniques used in reservoir evaluation. • Demonstrate knowledge of how to integrate logs for more accurate interpretation.
9. Teaching and learning strategies	
Strategy	Lectures, discussions, class assignments, homework and reports

10. Course structure

week	watches	Required learning outcomes	Name of unit or topic	Learning method	Evaluation method
1	2		Course Introduction and Syllabus		
2	2	Define and describe of well logging	Introduction to Well logging, History of well logging	Live lectures + discussion	Conduct an evaluation exam
3	2	List and label the basic rock properties	Basic Rock Properties: Rocks type, Porosity, Permeability, and fluid saturation	Live lectures + discussion	Ask and discuss questions
4	2	List and describe the petrophysical properties	Fluid Saturation and ways of measurement, Capillary pressure, Clay and Shale distribution	Live lectures + video presentations	Ask and discuss questions
5	2	Recognize the Electrical Properties	Electrical Properties ,Resistivity, Formation	Live lectures + discussion	Conduct an evaluation

		of Formation	Factor, Water Saturation Estimation.		exam
6	**2**	Summarize the Borehole Environment	Borehole Environment and Mud Drilling.	Live lectures + discussion	Ask and discuss questions
7	**2**	Define a Mud and Invasion profiles	Fluid Drilling Mud and Invasion profiles	Live lectures + discussion	Ask and discuss questions
8	**2**	Compare between well logging methods and techniques	Wireline Well-Logging Techniques: Open-hole logging, Cased-hole logging, (LWD) and (MWD), Well Logging Methods	Live lectures + video presentations	Ask and discuss questions
9	**2**	Define Temperature Logging	Temperature Logging.	**Live lectures + discussion**	Ask and discuss questions
10	**2**		Exam		
11	**2**	Recognize Mechanical Calipers Log	Mechanical Calipers Log	Live lectures + discussion	Ask and discuss questions
12	**2**	Define GR log	Gamma-Ray Logs Introduction	Live lectures + video presentations	Ask and discuss questions
13	**2**	Evaluate the V_{sh}	Application of GR Log-1, Estimation the V_{sh}	Live lectures + discussion	Ask and discuss questions
14	**2**	Evaluate Mineral types	Application of GR Log-2, Mineral Identification		Conduct an evaluation exam
15	**2**		Exam	Live lectures + discussion	
16	**2**	Estimate Electrical Logs	Electrical Logs: Spontaneous Potential (SP) Log requirements for the existence of an SP current, The Source of SP: Shale Potential and liquid junction Potential	Live lectures + video presentations	Ask and discuss questions
17	**2**	List Factors affecting on SP value	Factors affecting on SP value, Static Spontaneous Potential (SSP), SP deflection with different resistivities, Uses of SP log	Live lectures + discussion	Ask and discuss questions
18	**2**	Define the resistivity logs	Resistivity logs-Introduction		Conduct an evaluation exam
19	**2**	Describe the normal log's types	Normal log's types, The Basic Laterologs	Live lectures + discussion	Ask and discuss questions
20	**2**	Describe The Dual Laterolog,	The Dual Laterolog,	Live lectures + video presentations	Conduct an evaluation exam
21	**2**	Define Induction Logging	Induction Logging	Live lectures + discussion	Ask and discuss questions
22	**2**	List porosity logs	Porosity Logs: Density Log		Ask and discuss questions
23	**2**	Describe the neutron log	Neutron Log	Live lectures + discussion	Conduct an evaluation exam
24	**2**	List Applications of Neutron –Density	Applications of Neutron –Density logs	Live lectures + video	

		logs		presentations	
25	**2**	Interpret Quick-look Technique	Quick-look Technique	Live lectures + discussion	Ask and discuss questions
26	**2**		Exam		
27	**2**	Define sonic log	Sonic Log	Live lectures + discussion	Conduct an evaluation exam
28	**2**	Interpret Cross plotting Porosity Logs	Cross plotting Porosity Logs	Live lectures + video presentations	Ask and discuss questions
29	**2**	Interpret set of logs	Interpretation of Logs Set	Live lectures + discussion	Conduct an evaluation exam
30	**2**		Exam		

Practical Part	
Week 1	**Lab 1:** Calculation of porosity theoretically, Calculation Permeability by Darcy's Law and relationship between water saturation and porosity.
Week 2	**Lab 2:** Measurement the fluid saturation, Find formation resistivity factor (F), water saturation Sw estimation by Archie equation.
Week 3	**Lab 3:** Resistivity of NaCl water solution, Estimation of formation temperature with depth
Week 4	**Lab 4:** Estimation the cementation factor
Week 5	**Lab 5:** Estimation the saturation exponent
Week 6	**Lab 6:** Calipers Log interpretation
Week 7	**Lab 7:** Applications of gamma ray log
Week 8	**Lab 8:** Application of SP log
Week 9	**Lab 9:** Correct the laterologs to true resistivity

11. Course Evaluation and Grade Divisions

First semester grade: 10 theoretical and 5 practical (exams and reports)
Midterm grade: 15 theoretical and 5 practical
Second semester grade: 10 theoretical and 5 practical (exams and reports)
Final exam: 40 theoretical and 10 practical.

12. Learning and teaching resources

Required textbooks (methodology if any)	Asquith, G., and Krygowski, D., 2004, Basic Well Log Analysis, AAPG Methods in exploration 16, Tulsa, Oklahoma, USA, 244p
Main References (Sources)	1. Rider, M., (2002): The Geological Interpretation of well logs (2nd ed.), Whittles Publishing, 280P.Hencher, S., 2015. Practical Rock Mechanics 2. Schlumberger, (2002): Log interpretation, Principles/Applications .
Recommended supporting books and	Lie, H., (2017): Principles and Applications

references (scientific journals, (...reports	of Well Logging, Petroleum Industry Press and Springer-Verlag Berlin Heidelberg, 356P.
Electronic references, websites	http://www.slb.com https://www.spec2000.net/index.htm
Curriculum or description update rate	%10

Name and signature of the decision holder

Name and signature of the decision holder

Dr. Rahma Sael Al-Auqadi

1. Course Name:

Mining Engineering / Third Year

2. Course Code:

ME 315

3. Semester / Year:

Annual / 2024-2025

4. Description Preparation Date:

October 1, 2024

5. Available Attendance Forms:

In-person (On-campus)

6. Number of Credit Hours (Total) / Number of Units (Total)

114 hours / 6 Units

7. Course administrator's name (mention all, if more than one name)

Name: **Dr. Nihad Saoud Najim**
Email: nihadsaoud@uomousl.edu.iq

8. Course Objectives

Course Objectives	The course aims to provide students with foundational knowledge in mining engineering, including types and methods of mining, identification of mining equipment, design approaches, and the criteria for selecting appropriate mining methods. It also focuses on applying this knowledge to evaluate and solve issues related to mine and quarry operations, such as slope failures. Topics include slope angle determination in open-pit mines and support techniques (surface and underground) to enhance safety factors.

9. Teaching and Learning Strategies

Strategy	• Building conceptual and scientific foundations to develop technical competence. • Understanding the most common mining methods. • Ability to design and define mine operations based on given data and constraints. • Identification of the major challenges facing mining engineers, especially slope failures and operational safety.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
The first	**2**	Introduction to mining engineering, Mining terminology - Review	**Introduction**	Theoretical	Explanation and discussion
The second	**4**	Ores and major types of Ores.	**Ores and major types of Ores.**	Theoretical +discussion	General questions and discussion or exam
The third	**4**	Mining engineering and Mineral	**Mining engineering and Mineral**	Theoretical	Explanation,

		Processing.	**Processing.**	+discussion	discussion and short exam
Fourth	**4**	Mining techniques (divided into two common excavation types).	**Mining techniques**	Theoretical +discussion	General questions and discussion or exam
Fifth	**4**	Surface Mining (definition and introduction. Mining excavations).	**Surface Mining**	Theoretical +discussion	General questions and discussion or exam
Sixth	**4**	Surface-mining methods, Area mines (characteristic, Mining excavations).	**Surface-mining methods**	Theoretical +discussion	General questions and discussion or exam
Seventh	**4**	Open Pit Mining (definition and characteristic, Mining excavations).	**Open Pit Mining**	Theoretical +discussion	Explanation and discussion
The eighth	**4**	Stages in the life of Open Pit mine, Pushbacks and benches.	**Stages in the life of Open Pit mine**	Theoretical +discussion	Explanation, discussion and exam
Ninth	**4**	Consideration of Pit slop: design and bench configuration.	**Consideration of Pit slop**	Theoretical +discussion	to explain and discussion
tenth	**4**	Production cycle: kind of haul road systems.	**Production cycle**	Theoretical +discussion	Explanation, discussion and exam
eleventh	**2**	Monthly exam.	**Monthly exam.**	Theoretical	Monthly Exam
twelfth	**4**	Quarrying (definition, characteristic), Glory Holing.	**Quarrying**	Theoretical +discussion	discussion
thirteenth	**4**	Strip Mining (definition, processing and characteristics, mining excavations).	**Strip Mining**	Theoretical +discussion	Explanation, discussion and exam
fourteenth	**4**	Contour mines { (characteristic), Mountaintop removal: Characteristic and processing, Mining excavations}	**Contour mines**	Theoretical +discussion	to explain and discussion
fifteenth	**4**	Surface Techniques-Solution: aqueous extraction methods: Placer mining.	**Surface Techniques**	Theoretical +discussion	Explanation, discussion and exam
sixteenth	**4**	Consideration of a Pit slop design and bench configuration	**Consideration of a Pit slop design and bench configuration**	Theoretical +discussion	Explanation, discussion and exam
seventeenth	**4**	Production Cycle & Haul Road Design	**Production Cycle & Haul Road Design**	Theoretical +discussion	to explain and discussion
eighteenth	**4**	Modeling in Surface Mining Engineering, practice and discussion.	**Modeling in Surface Mining Engineering, practice and discussion.**	Theoretical +discussion	Explanation, discussion and exam
nineteenth	**4**	Underground mining (engineering Terminology in	**Underground mining (engineering Terminology in**	Theoretical +discussion	Explanation, discussion and

		Mineral Processing):	**Mineral Processing):**		exam
Twenty	**4**	Definition and characteristic.	**Definition and characteristic.**	Theoretical +discussion	to explain and discussion
twenty-first	**4**	Stages in the life of Underground mining: Mining Operations Stages: Prospecting, Exploration, Mine Development, Exploitation,	**Stages in the life of underground mining**	Theoretical +discussion	Explanation, discussion and exam
twenty-second	**4**	Ventilation, Reclamation.	**Ventilation, Reclamation.**	Theoretical +discussion	Explanation, discussion and exam
twenty-third	**4**	Underground mining techniques include. Drift, Slope, Shaft Mining.	**Underground mining techniques**	Theoretical +discussion	to explain and discussion
twenty-fourth	**4**	Underground M. Unsupported methods, Rooms and Pillars, Mining excavations.	**Underground M. Unsupported methods**	Theoretical +discussion	Explanation, discussion and exam
twenty-fifth	**4**	Ground control: pillar design and roof bolting.	**Ground control**	Theoretical +discussion	Explanation, discussion and exam
twenty-sixth	**2**	Monthly exam.	**Monthly exam.**	theoretical	Monthly Exam
twenty-seventh	**4**	Supported mining methods: Longwall Mining, Mining excavations.	**Supported mining methods**	Theoretical +discussion	Explanation, discussion and exam
twenty-eighth	**4**	Shrinkage stopping mining and Sublevel stopping.	**Shrinkage stopping mining and Sublevel stopping.**	Theoretical +discussion	Explanation, discussion and exam
twenty-ninth	**4**	Cut-and-fill stopping.	**Cut-and-fill stopping.**	Theoretical +discussion	to explain and discussion
thirty	**4**	Environmental Impacts of Mining.	**Environmental Impacts of Mining.**	Theoretical +discussion	Explanation, discussion and exam

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports.... etc.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Not available
Main references (sources)	1- Applied Mining Geology 2- Guidelines and Considerations for Open Pit Designers. 3- Surface and Underground Excavations Methods Introduction to Mineral Exploration
Recommended books and references (scientific	Rock Blasting in Open Pit Mining

journals, reports…)	
Electronic References, Websites	Articles from the Internet

Name and signature of the department head

Dr. Azealdeen Salih Hassan

Name and signature of the course lecturer

Dr. Nihad Saoud Najim

Course Description Form Rock Mechanics

1. Course Name:

Rock Mechanics third stage

2. Course Code:

ME305

3. Semester / Year:

2024-2025

4. Description Preparation Date:

1/10/2024

5. Available Attendance Forms:

Physical and online

6. Number of Credit Hours (Total) / Number of Units (Total)

120 hours / 4 units

7. Course administrator's name (mention all, if more than one name)

Name: Dr. Azealdeen Salih Hassan Al-Jawadi
Email: azealdeenaljawadi@uomosul.edu.iq
Name: Sarah Mwafaq Abdulaziz
Email: saraaltaie87@uomosul.edu.iq

8. Course Objectives

- Study rock mechanics and its role in engineering applications.
- Prepare students to understand the subjects of tunneling and mining engineering they will receive in the fourth year.
- Enabling students to calculate and analyze laboratory and field results and apply them to engineering and design projects.
- Prepare students practically and scientifically to solve problems they will encounter in their practical life after graduation.
- Apply the basic principles of mechanics and geology to evaluate the response of rocks when affected by environmental forces, changes in the original forces surrounding the rocks and their impact on factors resulting from engineering projects.

9. Teaching and Learning Strategies

This science is concerned with applying the basic principles of rock mechanics and geological influences to evaluate the response of rocks when engineering projects are implemented in, on, and within them, and the change in stresses and their concentration, as well as any change in the original forces surrounding and on the rocks due to the influence of factors resulting from engineering projects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Knowledge Comprehension	Introduction to rock mechanics	Theoretical practical	General Questions
2	4	Knowledge, Comprehension, Understanding	How do we look at rocks from an engineering point of view	Theoretical practical	General Questions and Discussion

3	4	Scientific Practical Skills	Rock mechanics and rock engineering	Theoretical practical	General Questions
4	4	Scientific Practical Skills	Introduction to structure motion	Theoretical practical	Daily Exam
5	4	Scientific Practical Skills	Physical Properties of rocks I	Theoretical practical	General Questions
6	4	Scientific Practical Skills	Physical Properties of rocks II	Theoretical practical	General Questions and Discussion
7	4	Scientific Practical Skills	Mechanical Properties of rocks I	Theoretical practical	General Questions
8	4	Scientific Practical Skills	Mechanical Properties of rocks II	Theoretical practical	Homework
9	4	Scientific Practical Skills	Exam	Theoretical practical	Monthly Exam
10	4	Scientific Practical Skills	Stress and strain	Theoretical practical	General Questions and Discussion
11	4	Scientific Practical Skills	Creep	Theoretical practical	General Questions
12	4	Scientific Practical Skills	Mohr circle representation of stress state	Theoretical practical	General Questions and Discussion
13	4	Scientific Practical Skills	Stereographic interpretation	Theoretical practical	General Questions
14	4	Scientific Practical Skills	Application of planar and wedge failure	Theoretical practical	Homework
15	4	Scientific Practical Skills	Exam	Theoretical practical	Monthly Exam
16	4	Knowledge, Comprehension, Understanding	Field survey	Theoretical practical	General Questions and Discussion
17	4	Scientific Practical Skills	Outcrop description I	Theoretical practical	General Questions
18	4	Scientific Practical Skills	Outcrop description II	Theoretical practical	General Questions and Discussion
19	4	Scientific Practical Skills	Rock Quality Designation	Theoretical practical	Daily Exam
20	4	Scientific Practical Skills	Terzaghi Classification System	Theoretical practical	General Questions and Discussion
21	4	Scientific Practical Skills	Geological Strength Index System	Theoretical practical	General Questions
22	4	Scientific Practical Skills	Exam	Theoretical practical	Monthly Exam
23	4	Scientific Practical Skills	Rock Mass Rating System	Theoretical practical	Homework
24	4	Knowledge, Comprehension, Understanding	Rock Tunneling Quality Index Q-System	Theoretical practical	General Questions
25	4	Scientific Practical Skills	Strength of rock and rock mass	Theoretical practical	General Questions and Discussion
26	4	Scientific Practical Skills	Rock slope stability I	Theoretical practical	General Questions
27	4	Scientific Practical Skills	Rock slope stability II	Theoretical practical	General Questions and Discussion
28	4	Scientific Practical Skills	Stress concentration in underground openings	Theoretical practical	General Questions
29	4	Scientific Practical Skills	Useful Formulas	Theoretical practical	Homework
30	4	Scientific Practical Skills	Exam	Theoretical practical	Comprehensive Exam

11. Course Evaluation

Monthly Exam: 20

Midterm Exam: 20 Daily Exams: 5 Reports: 5 Final Exam: 50

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1. Obert and Duvall, 1968. Rock mechanics and the design of structures in rocks
Main references (sources)	2. Application of Rock Mechanics in Surface and Underground Mining 3. Design Analysis in Rock Mechanics, Vol. 1&2
Recommended books and references (scientific journals, reports...)	4. Hudson and Harrison, Engineering rock mechanics
Electronic References, Websites	5. www.rocscince.org
Curriculum or description update rate	15%

Name and signature of the department head

Dr. Azealdeen Salih Hassan

Name and signature of the course lecturer

Dr. Azealdeen Salih Hassan

Course Description Form

1. Course Name:
Petroleum Product Engineering
2. Course Code:
PRE301
3. Semester / Year:
Third Class
4. Description Preparation Date:
15/9/2024
5. Available Attendance Forms:
Student attendance
6. Number of Credit (Total) / Number of Units (Total):
90 Hours
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Nabil Yousif Mohammed Email: nabil.albanna@uomosul.edu.iq

8. Course Objectives	
Course Objectives	1. Learn about the oil well and its types. 2. Study the types of flow within an oil reservoir and the types of complete oil wells. 3. Study the types of early well perforation methods and related perforation directions and types of perforation fluids. 4. In addition to the above, the semester covers all the basic terms for preparing wells for oil production. 5. Identify oil production problems, primarily water and gas congestion, and how to address their impact. 6. Identify Drill Stem Testing (DST), the benefits they have on production and oil field depletion, and how to calculate them. 7. Study the devices and equipment used to isolate and separate gas associated with field production.
9. Teaching and Learning Strategies	
Strategy	The teaching strategy in this course depends on the instructor explaining the topic, clarifying this by presenting realistic examples similar to the course, and then discussing the course vocabulary with the students.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
week1	3		Introduction to Production Technology	Lectures,video lectures	General questions and discussion
Week2	3		Reservoir Drive Mechanisms	Lectures,video lectures	Questions and Discussion
Week3	3		Flow geometries (Radial flow ,Linear flow, Spherical and hemispherical flow)	Lectures,video lectures	Questions and Discussion
Week4	3		Fluid flow equations (Darcy's Law)	Lectures,video lectures	Quiz
Week5	3		Completion Design Consideration	Lectures,video lectures	Discussion & General questions
Week6	3		Methods of completion	Lectures,video lectures	Exam
Week7	3		Selection of the flow conduit between the reservoir and surface	Lectures,video lectures	Discussion & General questions
Week8	3		Monthly examination	Lectures,video lectures	Questions and Discussion
Week9	3		Conventional tubular configurations:	Lectures,video lectures	Questions and Discussion
Week10	3		Completion Equipment	Lectures,video lectures	Group assignments
Week11	3		Production packer setting methods	Lectures,video lectures	Questions and Discussion
Week12	3		Well Completion Program	Lectures,video lectures	Discussion & Quiz
Week13	3		Perforating Techniques	Lectures,video lectures	Discussion & General questions
Week14	3		Perforation Charge Arrangement	Lectures,video lectures	Group assignments
Week15	3		Final Monthly examination	Lectures,video lectures	Exam
Week16	3		Water and gas coning	Lectures,video lectures	Discussion & General questions
Week17	3		Meyer and Gardner and Pirson Methods (Gas coning, water coning)	Lectures,video lectures	Questions and Discussion
Week18	3		Simultaneous Gas and Water coning	Lectures,video lectures	Questions and Discussion
Week19	3		Completion Efficiency (S fm)	Lectures,video lectures	Group assignments
Week20	3		Completion Efficiency (SC, Spp)	Lectures,video lectures	Questions and Discussion
Week21	3		Flow efficiency	Lectures,video lectures	Questions and Discussion
Week22	3		Drill Stem Testing, DST	Lectures, Tutorial	Exam
Week23	3		Monthly examination	Lectures,video lectures	Group assignments
Week24	3		Pressure versus Time Plot	Lectures,	Questions and

				Tutorial	Discussion
Week25	3		Steps of determining reservoir properties by using Horner plot to analysis pressure buildup test:	Lectures,video lectures	Questions and Discussion
Week26	3		Reservoir and fluid anomaly indications	Lectures,video lectures	Questions and Discussion
Week27	3		Depletion	Lectures, Tutorial	Group assignments
Week28	3		Oil and Gas Separation	Lectures,video lectures	Questions and Discussion
Week29	3		Separators Design , Capacity of separators	Lectures, Tutorial	Questions and Discussion
Week30	3		Final Monthly examination	Lectures,video lectures	Exam

11. Course Evaluation

The grade is distributed out of 100 based on the tasks assigned to the student, such as daily preparation, daily, oral, monthly, and written exams, reports, etc. (Monthly exams 30%, classroom activities and reports 10%, end-of-course exam 60%).

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Petroleum product engineering
Main references (sources)	Reservoir Engineering Hand Book (Tarek Ahmad)
Recommended books and references (scientific journals, reports…)	Fundamental of Reservoir Engineering (L. P. Dake)
Electronic References, Websites	

Head of the Department

Course Description Form

1. Course Name:
Engineering of Sulfur Production Processes
2. Course Code:
ME 318
3. Semester / Year:
Third Class
4. Description Preparation Date:
29/9/2024
5. Available Attendance Forms:
Student attendance
6. Number of Credit (Total) / Number of Units (Total):
150 Hours/ 6 Units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Marwa Hassan Yahya Email: marwaaltamer@uomosul.edu.iq Name: Dr. Islam Kamal Saeed Email: **islam.kamal158@uomosul.edu.iq**
8. Course Objectives

Course Objectives	This study aims to provide a comprehensive study of sulfur, its formation, sources, extraction methods, the presence of raw sulfur in Iraq, and the contribution of sulfur ore obtained from the consumption of Mishraq and Kamel. It also aims to provide an understanding of industrial sulfur applications, their effects on the environment and humans, and ways to mitigate these effects.
9. Teaching and Learning Strategies	
Strategy	A- Knowledge and Understanding 1. Knowledge of the main methods of sulfur extraction 2. A detailed study of the sulfur fields located south of Mosul (the Mishraq fields) 3. A comprehensive study of the most important areas where sulfur is used as a raw material. 4. An understanding of the methods used to reduce pollution caused by sulfur gases.

10. Course Structure				
Theoretical Part				
Week	**Hours**	**Unit or subject name**	**Learning method**	**Evaluation method**
Week1	3	Introduction, Allotropes of Sulfur.	Lectures	Discussion & General questions
Week2	3	Source of Sulfur, Natural Sources of Sulfur.	Lectures, Tutorial	Questions and Discussion
Week3	3	Man-Made Sources of Sulfur (Natural Gas), Claus process.	Lectures	Questions and Discussion
Week4	3	Man-Made Sources of Sulfur (Petroleum, Oil Sands).	Lectures, Tutorial	Group assignments
Week5	3	Man-Made Sources of Sulfur (Sulfide Smelting, and Coal).	Lectures, video lectures	Questions and Discussion
Week6	3	Create of Sulfur.	Lectures,	Questions and Discussion
Week7	3	Frasch mines processing method.	Lectures, video lectures	Exam
Week8	3	The algorithm of functioning of well sensors.	Lectures, Tutorial	Group assignments
Week9	3	Properties of Sulfur (Melting/Freezing Point, Viscosity, Density, Color, Thermal Conductivity).	Lectures, Tutorial	Questions and Discussion
Week10	3	Monthly Exam.	Exam	
Week11	3	Sulfur solidification and handling systems.	Lectures, video lectures	Questions and Discussion
Week12	3	The Sandvik Rotoform process, Process description – pastillation with the Rotoformer.	Lectures, Tutorial	Group assignments
Week13	3	Types of Rotoformer, Advantages of pastillation.	Lectures, video lectures	Questions and Discussion
Week14	3	Environmental aspects, Handling of solid sulfur.	Lectures, Tutorial	Questions and Discussion
Week15	3	Midterm Exam.		Exam
Week16	3	Al-Mishraq raw elemental sulfur, methods to sulfur purification.	Lectures, video lectures	Discussion & General questions
Week17	3	Sulfur Production Process Stages in Mishraq Sulfur Mine.	Lectures, Tutorial	Questions and Discussion
Week18	3	Production of Sulfuric Acid: The lead chamber process.	Lectures, video lectures	Questions and Discussion
Week19	3	Production of Sulfuric Acid: The Contact	Lectures, Tutorial	Group assignments

		process.		
Week20	3	Wet Contact Process, Pressure Process, Process Control Optimization.	Lectures, video lectures	Questions and Discussion
Week21	3	Alum production, Detection of alum, Uses of Alum.	Lectures, video lectures	Questions and Discussion
Week22	3	Fertilizers.	Lectures, Tutorial	Exam
Week23	3	Sulfur nanoparticles. Application of sulfur nanoparticles	Lectures, video lectures	Group assignment
Week24	3	Monthly exam.	Lectures, Tutorial	Questions and Discussion
Week25	3	Environment and sulfur.	Lectures, video lectures	Questions and Discussion
Week26	3	Hazard rating of sulfur.	Lectures, video lectures	Questions and Discussion
Week27	3	Health hazards of sulfur.	Lectures, Tutorial	Group assignment
Week28	3	Health hazards of sulfur dioxide.	Lectures, video lectures	Questions and Discussion
Week29	3	Acid rain.	Lectures, Tutorial	Questions and Discussion
Week30	3	Monthly exam		Exam

Practical Part

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week1	2	1	General information, Safety in the laboratory.	Lectures	Discussion & General questions
Week2	2	1	Introduction of Sulfur element , Physical properties, Melting point of Sulfur.	Lectures, video lectures	Questions and Discussion
Week3	2	1	Chemical properties of sulfur.	Lectures, Tutorial	
Week4	2	1	Analytical Methods for Sulfur Determination in Glasses, Rocks and Minerals, Infrared absorption technology.	Lectures, video lectures	Questions and Discussion
Week5	2	1	Isotope effects	Lectures, Tutorial	Questions and Discussion
Week6	2	1	Mass spectrometer technology.	Lectures, video lectures	Questions and Discussion
Week7	2	1	X-ray fluorescence.	Lectures, video lectures	Questions and Discussion
Week8	2	1	Separation Processes: Distillation.	Lectures, video lectures	Questions and Discussion
Week9	2	1	Crystallization.	Lectures, Tutorial	Questions and Discussion
Week10	2	1	*Monthly exam.*	Exam	

Week11	2	1	Adsorption process.	Lectures, Tutorial	Group assignmen
Week12	2	1	*Absorption and Stripping.*	Lectures, Tutorial	Questions and Discussion
Week13	2	1	Manifestation of sulfur, Frasch process.	Lectures, video lectures	Questions and Discussion
Week14	2	1	Production of sulfur from hydrogen sulfide: Chemically, Biologically.	Lectures, Tutorial	Questions and Discussion
Week15	2	1	Midterm exam.		Exam
Week16	2	1	Purification of Al-Mishraq raw elemental sulfur.	Lectures, Tutorial	Questions and Discussion
Week17	2	1	Extraction of sulfur from the raw sulfur in laboratory.	Lectures, Tutorial	Group assignmen
Week18	2	1	Discuss reports	Lectures, Tutorial	Questions and Discussion
Week19	2	1	The most important applications of sulfur.	video lectures	Questions and Discussion
Week20	2	1	Sulfur modified asphalt, Rheological properties of asphalt.	video lectures	Questions and Discussion
Week21	2	1	Rheological properties of asphalt, Procedure of sulfur addition on the rheological properties of virgin asphalt.	video lectures	Questions and Discussion
Week22	2	1	Scientific visit at the Company of Al. Mishraq Sulfur.	Discussion	Discussion & General questions
Week23	2	1	The preparation of the Sulfuric acid in lab, The °Baume scale.	video lectures	Questions and Discussion
Week24	2	1	*Monthly exam.*		Exam
Week25	2	1	Introduction of alum, Alum preparation. The procedure of Alum (aluminum sulfate) in laboratory.	video lectures	Questions and Discussion
Week26	2	1	Calculation of theoretical and Experimental yield of alum, Some examples.	Lectures, Tutorial	Questions and Discussion
Week27	2	1	Fertilizers production, types, uses.	Lectures, Tutorial	Questions and Discussion
Week28	2	1	Procedure of Fertilizers in laboratory.	Lectures, Tutorial	Questions and Discussion
Week29	2	1	Discuss reports	Discussion	Discussion & General questions
Week30	2	1	Final exam.		Exam

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports.... etc.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Sulfur. History, Technology, Applications & Industry. Gerald

	Kutney, 2013
Main references (sources)	Sulphur Dioxide: Environmental Effec Fate and Behaviour. WBK & Associa Inc. 2003.
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	
5%	Update ratio

اسم وتوقيع صاحب المقرر
م.د. مروة حسان يحيى

اسم وتوقيع رئيس القسم او الفرع

م.د. اسلام كمال سعيد