

# MODULE DESCRIPTION

## وصف المادة الدراسية

| Module Information                 |                |                       |                                                                                                                                                                                                                                                     |                        |                                                                                  |
|------------------------------------|----------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                |                       |                                                                                                                                                                                                                                                     |                        |                                                                                  |
| Module Title                       | Gas Technology |                       | Module Delivery                                                                                                                                                                                                                                     |                        |                                                                                  |
| Module Type                        | Core           |                       | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                        |                                                                                  |
| Module Code                        | PE310          |                       |                                                                                                                                                                                                                                                     |                        |                                                                                  |
| ECTS Credits                       | 3              |                       |                                                                                                                                                                                                                                                     |                        |                                                                                  |
| SWL (hr/sem)                       | 75             |                       |                                                                                                                                                                                                                                                     |                        |                                                                                  |
| Module Level                       |                | 3                     | Semester of Delivery                                                                                                                                                                                                                                |                        | 5                                                                                |
| Administering Department           |                | Petroleum Engineering | College                                                                                                                                                                                                                                             | College of Engineering |                                                                                  |
| Module Leader                      |                | Dr. Najeh Y. Alali    |                                                                                                                                                                                                                                                     | e-mail                 | <a href="mailto:dr.najehalali@alayen.edu.iq">dr.najehalali@alayen.edu.iq</a>     |
| Module Leader's Acad. Title        |                | Assit.prof            | Module Leader's Qualification                                                                                                                                                                                                                       |                        | Ph.D.                                                                            |
| Module Tutor                       |                | Dr. Najeh Y. Alali    |                                                                                                                                                                                                                                                     | e-mail                 | <a href="mailto:dr.najehalali@alayen.edu.iq">dr.najehalali@alayen.edu.iq</a>     |
| Peer Reviewer Name                 |                | Hasnaa M.EL-Arwash    |                                                                                                                                                                                                                                                     | e-mail                 | <a href="mailto:Hasnaa.Mohammed@alayen.edu.iq">Hasnaa.Mohammed@alayen.edu.iq</a> |
| Scientific Committee Approval Date |                | 2025/10/5             | Version Number                                                                                                                                                                                                                                      |                        | 1.0                                                                              |

| Relation with other Modules       |       |          |   |
|-----------------------------------|-------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |       |          |   |
| Prerequisite module               | None  | Semester |   |
| Co-requisites module              | PE215 | Semester | 5 |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                                                                                                                                                                            |
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| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                            |
| Module Objectives<br>أهداف المادة الدراسية               | <p>By completing this module, learners will:</p> <ul style="list-style-type: none"> <li>Understand definitions of terms used in the petroleum industry to describe natural gas reservoirs , Natural Gas Composition and Phase Behavior</li> <li>Analyze Natural Gas properties empirically derived correlations, gas production</li> </ul> |



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|                                                                      | <p>operations and recovery factor.</p> <ul style="list-style-type: none"> <li>• Conduct the inflow performance or reservoir flow capacity and all calculations of natural gas flow in wells.</li> <li>• Characterize relationship between flow rate coming into a well and the sand-face pressure or flowing bottom-hole pressure.</li> <li>• Optimize the productivity or absolute open flow potential of gas wells.</li> <li>• Manage all calculations processing of Natural Gas flow through Restrictions and required equations for calculating the flow of gases in pipelines.</li> </ul>                                                                                                                                                                                                                                                                                               |    |                                                                                                                                                                                                                                                                                               |
| <b>Module Learning Outcomes</b><br><br>مخرجات التعلم للمادة الدراسية | Knowledge                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | A2 | A2.1 Define Natural gas resources, Properties of gas and Reservoir Characterization.<br>A2.2 Classify Gas Types, treatment operations, gas viscosity, well testing and Productivity Index<br>A2.3 Illustrate Flow Rate, well test Life Cycle and Challenges and performance of gas reservoirs |
|                                                                      | Skills                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | B1 | B1.1 Function efficiently as an individual<br>B1.2 Function as a member of multidisciplinary and multicultural teams                                                                                                                                                                          |
|                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | B2 | B2.1 Communicate effectively – graphically with a range of audiences using contemporary tools.<br>B2.2 Communicate verbally and in writing with a range of audiences using contemporary tools.                                                                                                |
|                                                                      | Ethics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | C2 | C2.1 Recognize professional and ethical responsibility.<br>C2.2 Adhere and respect diversity.                                                                                                                                                                                                 |
| <b>Indicative Contents</b><br><br>المحتويات الإرشادية                | <ul style="list-style-type: none"> <li>• Introduction to Gas Production Technology</li> <li>• Gas Production Life Cycle and Challenges</li> <li>• The sweet and sour gas besides the performance of gas reservoirs</li> <li>• Determination of Z factor</li> <li>• Determination of gas viscosity</li> <li>• Well Testing and Flow Rate Determination</li> <li>• Gas Gathering Networks and Pipelines</li> <li>• Gas Storage and Underground Reservoirs</li> <li>• Gas Separation and Purification Processes</li> <li>• Flow Measurement Techniques in Petroleum Engineering</li> <li>• Dehydration and Sweetening Techniques</li> <li>• Gas Wellhead Equipment and Facilities</li> <li>• Separation and Gas Treatment Facilities</li> <li>• Regulatory Compliance and Sustainability in Gas Production</li> <li>• Sulfur Recovery and Disposal Methods (Problem Solving Session)</li> </ul> |    |                                                                                                                                                                                                                                                                                               |



| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                |
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| <b>Strategies</b>                                                             | <b>Teaching and Learning Strategies:</b> <ul style="list-style-type: none"> <li>• Presentation</li> <li>• Interactive learning</li> <li>• Report &amp; discussions assessment</li> <li>• Brainstorming</li> <li>• Group Solving Problems</li> <li>• Tutorial and graphics.</li> <li>• Self-learning</li> </ul> |

| <b>Student Workload (SWL)</b><br><b>الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا</b> |    |                                                                           |   |
|---------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطلاب خلال الفصل        | 48 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطلاب أسبوعيا       | 3 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل  | 27 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 2 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل               | 75 |                                                                           |   |

| <b>Module Evaluation</b><br><b>تقييم المادة الدراسية</b> |                     |             |                  |            |                           |
|----------------------------------------------------------|---------------------|-------------|------------------|------------|---------------------------|
|                                                          |                     | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b>                              | <b>Quizzes</b>      | 2           | 10% (10)         | 5 and 10   | A2                        |
|                                                          | <b>Assignments</b>  | 2           | 10% (10)         | 2 and 12   | A2                        |
|                                                          | <b>Projects</b>     | 1           | 10% (10)         | Continuous | B2                        |
|                                                          | <b>Report</b>       | 1           | 10% (10)         | 13         | A2                        |
| <b>Summative assessment</b>                              | <b>Midterm Exam</b> | 2hr         | 10% (10)         | 7          | A2                        |
|                                                          | <b>Final Exam</b>   | 3hr         | 50% (50)         | 16         | A2                        |
| <b>Total assessment</b>                                  |                     |             | 100% (100 Marks) |            |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br><b>المنهاج الاسبوعي النظري</b> |                                                                                               |                |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------|
|                                                                          | Material Covered                                                                              | LOs            |
| <b>Week 1</b>                                                            | <ul style="list-style-type: none"> <li>• Introduction to Gas Production Technology</li> </ul> | A2, B1, B2, C2 |

|                |                                                                                                                                                                                     |                |
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|                | <ul style="list-style-type: none"> <li>Gas Reservoir Types and Properties</li> </ul>                                                                                                |                |
| <b>Week 2</b>  | <ul style="list-style-type: none"> <li>Gas Production Life Cycle and Challenges</li> <li>Reservoir Characterization and Evaluation</li> </ul>                                       | A2, B1, B2, C2 |
| <b>Week 3</b>  | <ul style="list-style-type: none"> <li>The sweet and sour gas besides the performance of gas reservoirs</li> </ul>                                                                  | A2, B1, B2, C2 |
| <b>Week 4</b>  | <ul style="list-style-type: none"> <li>Determination of Z factor</li> </ul>                                                                                                         | A2, B1, B2, C2 |
| <b>Week 5</b>  | <ul style="list-style-type: none"> <li></li> <li>Determination of gas viscosity</li> </ul>                                                                                          | A2, B1, B2, C2 |
| <b>Week 6</b>  | <ul style="list-style-type: none"> <li>Well Testing and Flow Rate Determination</li> </ul>                                                                                          | A2, B1, B2, C2 |
| <b>Week 7</b>  | <ul style="list-style-type: none"> <li>Gas Gathering Networks and Pipelines</li> <li>Compression and Pressure Control in Gas Transportation</li> </ul>                              | A2, B1, B2, C2 |
| <b>Week 8</b>  | <ul style="list-style-type: none"> <li>Gas Storage and Underground Reservoirs</li> <li>Gas Separation and Purification Processes</li> </ul>                                         | A2, B1, B2, C2 |
| <b>Week 9</b>  | <ul style="list-style-type: none"> <li>Flow Measurement Techniques in Petroleum Engineering</li> <li>Flow in Pipes: Pressure Drop Calculations (Problem Solving Session)</li> </ul> | A2, B1, B2, C2 |
| <b>Week 10</b> | <ul style="list-style-type: none"> <li>Dehydration and Sweetening Techniques</li> </ul>                                                                                             | A2, B1, B2, C2 |
| <b>Week 11</b> | <ul style="list-style-type: none"> <li>Gas Wellhead Equipment and Facilities</li> <li>Separation and Gas Treatment Facilities</li> </ul>                                            | A2, B1, B2, C2 |
| <b>Week 12</b> | <ul style="list-style-type: none"> <li>Regulatory Compliance and Sustainability in Gas Production</li> </ul>                                                                        | A2, B1, B2, C2 |
| <b>Week 13</b> | <ul style="list-style-type: none"> <li>Sulfur Recovery and Disposal Methods (Problem Solving Session)</li> </ul>                                                                    | A2, B1, B2, C2 |
| <b>Week 14</b> | <ul style="list-style-type: none"> <li>Review of Key Concepts and Topics (Tutorial)</li> <li>Practice Problem-Solving Exercises (Tutorial)</li> </ul>                               | A2, B1, B2, C2 |
| <b>Week 15</b> | <ul style="list-style-type: none"> <li>Final Assessment, including Problem-Solving Questions and Application-Based Scenarios</li> </ul>                                             | A2, B1, B2, C2 |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                  |
|-------------------------------------------------------------------------|------------------|
|                                                                         | Material Covered |
| <b>Week 1</b>                                                           |                  |
| <b>Week 2</b>                                                           |                  |



| Learning and Teaching Resources<br>مصادر التعلم والتدريس |                                                                                                                                                                  |                           |
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|                                                          | Text                                                                                                                                                             | Available in the Library? |
| Required Texts                                           | 1. Natural Gas Production Engineering, Chi U. Ikoku<br>Advanced Natural Gas Engineering, Xiuli Wang, Michael Economides Gas Production Operations, H. Dale Beggs | No                        |
| Recommended Texts                                        | Advances in Natural Gas Technology : Hamid A. Al-Megren                                                                                                          | No                        |
| Websites                                                 | <a href="https://eng.alayen.edu.iq//colleges/e/42">https://eng.alayen.edu.iq//colleges/e/42</a>                                                                  |                           |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                  |                     |          |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks %  | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100 | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89  | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79  | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69  | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59  | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)  | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)   | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |          |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |          |                                       |