MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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| **Module Information**  **معلومات المادة الدراسية** | | | | | | | |
| **Module Title** | Materials Chemistry | | | | **Module Delivery** | | |
| **Module Type** | Basic | | | | * **☐ Theory** * **☒ Lecture** * **☒ Lab** * **☐ Tutorial** * **☐ Practical** * **☐ Seminar** | | |
| **Module Code** | MATE 103 | | | |
| **ECTS Credits** | 6 | | | |
| **SWL (hr/sem)** | 150 | | | |
| **Module Level** | | UGx11 1 | **Semester of Delivery** | | | | 1 |
| **Administering Department** | | Materials Engineering | **College** | College of Engineering | | | |
| **Module Leader** |  | | **e-mail** |  | | | |
| **Module Leader’s Acad. Title** | |  | **Module Leader’s Qualification** | | | |  |
| **Module Tutor** |  | | **e-mail** |  | | | |
| **Peer Reviewer Name** | |  | **e-mail** |  | | | |
| **Scientific Committee Approval Date** | | 13/06/2023 | **Version Number** | | |  | |

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

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| **Module Aims, Learning Outcomes and Indicative Contents**  **أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية** | |
| **Module Objectives**  **أهداف المادة الدراسية** | During the semester the students will:  1. Learn an idea about the atomic structures of compounds and atomic theories.  2. Learn the relationships between the structure of the atom and its properties in terms of determining the number of protons, neutrons and electrons.  3. Learn and understand the basics of chemical reactions.  4. Learn and understand the quantitative relationship between substances in balanced chemical equations and make equivalence calculations.  5. Knowing the laws of energy conservation in chemical reaction and thermodynamics.  6. Learn and understand redox reactions and electrochemistry.  7. Learn and understand an introduction to analytical chemistry.  8. Learn and understand organic compounds of their aliphatic and aromatic types. |
| **Module Learning Outcomes**  **مخرجات التعلم للمادة الدراسية** | 1. Understanding and teaching students the concepts of materials chemistry.  2. Enabling students to obtain knowledge and understanding the fields of material chemistry.  3. To make the student understand spatial scales, especially sizes, and according to the arrangement of atoms.  4. Enabling students to obtain knowledge in molecular orbital theory.  5. Enabling students to obtain knowledge and understanding the elements of the periodic table and the types of chemical bonds.  6. To make the student understand the different properties of the elements in the periodic table.  7. Enable students to obtain knowledge about gas laws, solve their problems, and hypotheses that explain the behaviour of gases.  8. Students' understanding of energies, their types, and energy changes in chemical reactions.  9. Enable students to understand thermodynamics and solve problems for the first and second laws of thermodynamics.  10. Enable students to understand the standard and random free energy of molecules and solve their problems.  11. Students’ understanding of oxidation-reduction reactions.  12. Enable students to understand the basics of analytical chemistry and prepare standard solutions of chemical compounds.  13. Enable students to understand organic compounds of various kinds, as well as organometallic compounds. |
| **Indicative Contents**  **المحتويات الإرشادية** | Indicative content includes the following.  Atoms and Molecules (Fundamental particles, Atomic models, hydrogen spectra, Kossel theory, Born-Hyber cycle, MO theory) [6 hrs.]  Periodic tables (Octet rule, Lewis symbol, Types of chemical bonds, Properties of periodic tables: Ionization energy, electronegativity, electrophilicity, atomic radius) [7 hrs.]  Gases (Gas pressure, The simple gas laws, Ideal gas law, Real gas law) [6 hrs.]  Energy (Types, Energy Changes in Chemical Reactions, Enthalpy of chemical reactions) [6 hrs.]  Thermodynamics, First law of thermodynamics, second law of thermodynamic) [8 hrs.]  Free Energy and Chemical Equilibrium, Heterogeneous reaction, Gibbs energy, entropy) [6 hrs.]  Redox Reactions and Electrochemistry [4 hrs.]  Introduction of analytical chemistry [4hrs.]  Introduction to Organic Chemistry (Aliphatic Hydrocarbons, Aromatic Hydrocarbons) [12 hrs.]  Organometallic compounds [4 hrs.] |
| **Course Description** | This course provides students an idea about the chemistry of materials and the theories that explain the molecular composition of chemical compounds and the properties of elements in the periodic table, Gases and their laws are also clarified and the required problems are solved, Thermodynamics and their laws have been explained, Redox reactions and electrochemistry are also recognized, organic compounds and their interactions and applying important experiments in the chemistry laboratory. |

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| **Learning and Teaching Strategies**  **استراتيجيات التعلم والتعليم** | |
| **Strategies** | 1. Providing students with the basics and additional topics related to the pre-skills education outcomes to solve practical problems.  2. Solve a set of practical examples by the academic staff.  3. Students participate during the lecture by solving some practical problems.  4.Develop students' skills through laboratory experiments approved for the curriculum |

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| **Student Workload (SWL)**  **الحمل الدراسي للطالب محسوب لـ 15 اسبوعا** | | | |
| **Structured SWL (h/sem)**  **الحمل الدراسي المنتظم للطالب خلال الفصل** | 60 | **Structured SWL (h/w)**  **الحمل الدراسي المنتظم للطالب أسبوعيا** | 4 |
| **Unstructured SWL (h/sem)**  **الحمل الدراسي غير المنتظم للطالب خلال الفصل** | 90 | **Unstructured SWL (h/w)**  **الحمل الدراسي غير المنتظم للطالب أسبوعيا** | 6 |
| **Total SWL (h/sem)**  **الحمل الدراسي الكلي للطالب خلال الفصل** | **150** | | |

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| **Module Evaluation**  **تقييم المادة الدراسية** | | | | | |
| **As** | | **Time/Number** | **Weight (Marks)** | **Week Due** | **Relevant Learning Outcome** |
| **Formative assessment** | **Quizzes** | 4 | 10% (10) | 3, 6 , 9 and 12 | LO #1, 2, 4,5 ,7, 8, 10 and 11 |
| **Assignments** | 4 | 10% (10) | 4 and 8 | LO # 1,3, 6 and 7 |
| **Projects / Lab.** | 15 | 10% (10) | Continuous | All |
| **Report** | 1 | 10% (10) | 13 | LO #5-10 |
| **Summative assessment** | **Midterm Exam** | 2hr | 10% (10) | 7 | LO #1 - #7 |
| **Final Exam** | 3hr | 50% (50) | 16 | All |
| **Total assessment** | | | 100% (100 Marks) |  |  |

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| **Delivery Plan (Weekly Syllabus)**  **المنهاج الاسبوعي النظري** | |
| **Week** | **Material Covered** |
| **Week 1** | Atoms and Molecules ( Fundamental particles, Atomic models, hydrogen spectra, Kossel theory) |
| **Week 2** | Born-Hyber cycle, MO theory, hybridization |
| **Week 3** | Periodic tables ( Octet rule, Lewis symbol, Chemical bonds, Ionization energy, electronegativity, electrophilicity, atomic radius) |
| **Week 4** | Gases ( Gas pressure, The simple gas laws) |
| **Week 5** | Ideal gas law, Real gas law |
| **Week 6** | Energy ( Types, Energy Changes in Chemical Reactions, Enthalpy of chemical reactions) |
| **Week 7** | Mid-term Exam - |
| **Week 8** | Thermodynamics, First law of thermodynamics, second law of thermodynamic |
| **Week 9** | Free Energy and Chemical Equilibrium, Heterogeneous reaction |
| **Week 10** | Gibbs energy, entropy |
| **Week 11** | Redox Reactions, Electrochemistry |
| **Week 12** | Introduction of analytical chemistry |
| **Week 13** | Introduction to Organic Chemistry, Aliphatic Hydrocarbons. |
| **Week 14** | Aromatic Hydrocarbons |
| **Week 15** | Organometallic compounds |
| **Week 16** | Final Exam |

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| **Delivery Plan (Weekly Lab. Syllabus)**  **المنهاج الاسبوعي للمختبر** | |
| **Week** | **Material Covered** |
| **Week 1** | Lab 1: Boiling point determination For chemical compounds |
| **Week 2** | Lab 2: Melting point determination For chemical compounds |
| **Week 3** | Lab 3: preparation of primary standard solution |
| **Week 4** | Lab 4: preparation of secondary standard solution |
| **Week 5** | Lab 5: Standardization of HCl and the determination of sodium hydroxide solution normality |
| **Week 6** | Lab6: Quantitative determination of the components of a solution composed of a mixture of sodium carbonate and sodium hydroxide |
| **Week 7** | Lab 7: Refracting titrant |
| **Week 8** | Lab 8: Titration Curves |
| **Week 9** | Lab 9: Viscosity measurement |
| **Week 10** | Lab10: Determine the relative and absolute densities of liquids using pycnometer |
| **Week 11** | Lab11: Adsorption of acetic acid with activated carbon particles |
| **Week 12** | Lab12: Determine the enthalpy of neutralization between a strong acid (HCl) and a strong base (NaOH) |
| **Week 13** | Lab13: Preparation of acetic acid |
| **Week 14** | Lab14: Detection of effective functional groups |
| **Week 15** | Lab15: Determination of water hardness |

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| **Learning and Teaching Resources**  **مصادر التعلم والتدريس** | | |
|  | **Text** | **Available in the Library?** |
| **Required Texts** | 1. R. Chang, J. Over by: General chemistry: the essential concepts, 6th ed, 2011. 2. O.V. Roussak • H.D. Gesser: Applied Chemistry A Textbook for Engineers and Technologists, 2nd ed, 2013. | Yes |
| **Recommended Texts** |  |  |
| **Websites** |  | |

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| **Grading Scheme**  **مخطط الدرجات** | | | | |
| **Group** | **Grade** | **التقدير** | **Marks %** | **Definition** |
| **Success Group**  **(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**  **(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 |
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| **Note:** 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. | | | | |