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|  | Ministry of Higher Education and Scientific Research - IraqUniversity of DiyalaCollege of EngineeringDepartment of Materials Engineering | D:\منهج بولونيا\تنزيل.jpg |

MODULE DESCRIPTION

وصف المادة الدراسية

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| **Module Information****معلومات المادة الدراسية** |
| **Module Title** | Principles of materials science II | **Module Delivery** |
| **Module Type** | Core | * **☐ Theory**
* **☒ Lecture**
* **☒ Lab**
* **☐ Tutorial**
* **☐ Practical**
* **☒ Seminar**
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| **Module Code** | MATE102 |
| **ECTS Credits**  | 8 |
| **SWL (hr/sem)** | 200 |
| **Module Level** | UGx11  | **Semester of Delivery** | 2 |
| **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** | 1.0 |

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| **Relation with other Modules****العلاقة مع المواد الدراسية الأخرى** |
| **Prerequisite module (MATE102)** | MATE101 | **Semester** | 1 |
| **Co-requisites module** | None |  |  |

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| **Module Aims, Learning Outcomes and Indicative Contents****أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية** |
|  **Module Objectives****أهداف المادة الدراسية** | This module aims to1. Provide an understanding of the of ceramic, polymers and composite materials.
2. Develop an understanding of the principal properties of engineering materials and the factors which affect their performance in use.
3. The course discusses the Principles of biomaterials and nanomaterials.
4. Gain a clear understanding of laboratory tests and practices.
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| **Module Learning Outcomes****مخرجات التعلم للمادة الدراسية** | 1. Describe ceramic materials.
2. Describe clay and refractory materials.
3. Get information about polymer-based materials and properties.
4. Describe composite materials.
5. Describe the principle of strengthening in composite materials.
6. Compare among materials according to their properties and applications.
7. Follow new developments in materials application field.
8. Identify the biomaterials and nano materials properties.
9. Get information about conductive materials
10. Get information about semiconductor materials.
11. Get information about insulator materials.
12. Compare among materials in term of conductivity.
13. Identify the nano materials properties.
14. Describe the applications of nano materials.
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| **Indicative Contents****المحتويات الإرشادية** | Basic concepts: Mechanical properties (elastic and plastic behaviour), mechanisms of deformation, toughness, ductility and brittleness. Phase equilibria, one and two-component systems. Atom movements and diffusion. Phase transformations: concepts of driving force, nucleation and growth.  |

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| **Learning and Teaching Strategies****استراتيجيات التعلم والتعليم** |
| **Strategies** | 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 seminars and by considering types of simple experiments involving some sampling activities that are interesting to the students. |

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| **Student Workload (SWL)****الحمل الدراسي للطالب محسوب لـ 15 اسبوعا** |
| **Structured SWL (h/sem)****الحمل الدراسي المنتظم للطالب خلال الفصل** | 75 | **Structured SWL (h/w)****الحمل الدراسي المنتظم للطالب أسبوعيا** | 5 |
| **Unstructured SWL (h/sem)****الحمل الدراسي غير المنتظم للطالب خلال الفصل** | 125 | **Unstructured SWL (h/w)****الحمل الدراسي غير المنتظم للطالب أسبوعيا** | 8.3 |
| **Total SWL (h/sem)****الحمل الدراسي الكلي للطالب خلال الفصل** | **200** |

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| **Module Evaluation****تقييم المادة الدراسية** |
| **As** | **Time/Number** | **Weight (Marks)** | **Week Due** | **Relevant Learning Outcome** |
| **Formative assessment** | **Quizzes** | 6 | 5% (5) | 2, 4, 6, 8, 10, 12 | LO #1 to #11 |
| **Assignments** | 3 | 5% (5) | 3, 7, 13 | LO #1 to #10 |
| **Projects / Lab.** | 2hrs.  | 10% (10) | Continuous | All  |
| **Group Presentation** | 1 | 10% (10) | 15 | LO #1 - #14 |
| **Summative assessment** | **Midterm Exam** | 2hrs.  | 20% (20) | 6 and 11 | LO #1 - #14 |
| **Final Exam** | 3hrs.  | 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, 2** | Introduction to ceramics, glass, glass-ceramics, wood. |
| **Week 3** | Clay Products, Refractories |
| **Week 4, 5** | Introduction to polymers: thermoplastic and thermoset |
| **Week 6** | 1st Exam. |
| **Week 7, 8** | Introduction to composite materials. Large-Particle Composites, Dispersion-Strengthened Composites |
| **Week 9** | Introduction to Nanomaterials: Introduction to nanotechnology, physics of low-dimensional materials, 0D, 1D, 2D and 3D confinement.  |
| **Week 10** | Applications of nano-materials. |
| **Week 11** | 2nd Exam. |
| **Week 12** | Introduction to: conductors, semiconductors, insulators. |
| **Week 13** | Introduction to biomaterials. |
| **Week 14** | Applications of biomaterials. |
| **Week 15** | Group Presentation (Seminar).  |
| **Week 16** | Final Exam |

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| **Delivery Plan (Weekly Lab. Syllabus)****المنهاج الاسبوعي للمختبر** |
| **Week**  | **Material Covered** |
| **Week 1, 2** | Lab 1: Preparation of specimen by pressing  |
| **Week 3, 4** | Lab 2: Drying and firing, Loss on ignition |
| **Week 5,6**  | Lab 3: Density and porosity |
| **Week 7, 8** | Lab 4: Viscosity of polymers  |

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| **Learning and Teaching Resources****مصادر التعلم والتدريس** |
|  | **Text** | **Available in the Library?** |
| **Required Texts** | 1- Materials Science and Engineering: An Introduction. W. D. Callister, D. G. Rethwisch. 9th Ed., John Wiley and Sons, New York (ISBN 978-0-470-41997-7). 2- C. Kittel, Introduction to Solid State Physics, 8th ed., Wiley, 2005.3- V. Raghavan, “Materials Science and Engineering: A First Course". | Yes |
| **Recommended Texts** | 1- Prentice Hall, 20062- D.R. Askeland, P.P. Phule, W.J. Wright, The Science and Engineering of Materials, 6th ed., Cengage Learning, 2010. | No |

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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. |