MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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| **Module Information****معلومات المادة الدراسية** |
| **Module Title** | Materials Physics | **Module Delivery** |
| **Module Type** | Basic | * **☐ Theory**
* **☒ Lecture**
* **☐ Lab**
* **☐ Tutorial**
* **☐ Practical**
* **☒ Seminar**
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| **Module Code** | MATE106 |
| **ECTS Credits**  | 4 |
| **SWL (hr/sem)** | 100 |
| **Module Level** | UGx11 1 | **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** | 10/06/2023 | **Version Number** | 1.0 |

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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** | 1. To develop problem solving skills and understanding of materials physics through the application of techniques.
2. To understand modern concept of atomic models.
3. This course deals with the basic concept of physical properties of materials.
4. This is the basic subject for all electrical and thermal properties.
5. To understand optical and magnetism properties of materials.
6. To implement the concepts and theory for solving the application related problems of materials physics.
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| **Module Learning Outcomes****مخرجات التعلم للمادة الدراسية** | Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.1. Recognize how physical properties works in materials physics.
2. List the various terms associated with materials physics.
3. Summarize what is meant by a basic materials physics.
4. Discuss the reaction and involvement of atoms in electrical conductivity.
5. Describe electrical, thermal, optical, magnetism, properties of materials.
6. Define Ohm's law.
7. Identify the basic materials physics and their applications.
8. Discuss the basic and mathematical methods for relativity and related fields.
9. Discuss the various properties of materials physics.
10. Explain the two interactions of light with solid, metal and non - metal.
11. Identify the classification of magnetic materials relationship with temperature.
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| **Indicative Contents****المحتويات الإرشادية** | Indicative content includes the following.Part A – Atomic modelAtomic model, Bohr’s quantum atomic model, Radii of orbits, velocity and frequency of electron, normal excited and ionized atoms, kinetic and potential energy of electron, modern concept of atomic model, DE Broglie wave, wavelength of electron wave, concept of standing wave, electron configuration. [6 hrs.]Part B – Electrical properties of materialsElectric conduction, electron mobility, electrical conductivity, electronic and ionic conduction, band structure in solid, electrical resistivity of metals, influence of temperature, influence of impurities, influence of plastic deformation. [6 hrs.]Part C – Thermal properties of materialsHeat capacity, theoretical models, thermal expansion, thermal conductivity, refractories, thermal stresses, thermal fatigue, thermal shock, melting point. [6 hrs.]Part E – Optical properties of materialsInteractions of light with solid, atomic and electronic interactions, optical properties of metals, optical properties of non – metals, applications of optical phenomena. [6 hrs.]Part F – magnetism of materialsIntroduction to magnetic materials, concept of magnetism, classification, Dia -, Para - , Ferro - , Antihero – and ferric – magnetic materials, influence of temperature on magnetic behavior, Domains and hysteresis, magnetic anisotropy applications in storage devices. [6 hrs.] |

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| **Learning and Teaching Strategies****استراتيجيات التعلم والتعليم** |
| **Strategies** | Type something like: 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. |

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| **Student Workload (SWL)****الحمل الدراسي للطالب محسوب لـ 15 اسبوعا** |
| **Structured SWL (h/sem)****الحمل الدراسي المنتظم للطالب خلال الفصل** | 33 | **Structured SWL (h/w)****الحمل الدراسي المنتظم للطالب أسبوعيا** | 2 |
| **Unstructured SWL (h/sem)****الحمل الدراسي غير المنتظم للطالب خلال الفصل** | 67 | **Unstructured SWL (h/w)****الحمل الدراسي غير المنتظم للطالب أسبوعيا** | 4.5 |
| **Total SWL (h/sem)****الحمل الدراسي الكلي للطالب خلال الفصل** | **100** |

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| **Module Evaluation****تقييم المادة الدراسية** |
| **As** | **Time/Number** | **Weight (Marks)** | **Week Due** | **Relevant Learning Outcome** |
| **Formative assessment** | **Quizzes** | 3 | 10% (10) | 4, 8 and 10 | LO #1, 2,,3,4,5, 7, 8 and #12 |
| **Assignments** | 2 | 10% (10) | 2 and 12 | LO #6, 9 and #11 |
| **Attendance** | 1 | 10% (10) | Continuous | All  |
| **Report** | 1 | 10% (10) | 13 | LO #5, #9 and #10 |
| **Summative assessment** | **Midterm Exam** | 2hr | 10% (10) | 8 | LO #1 - #9 |
| **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** | Atomic model, Bohr’s quantum atomic model, Radii of orbits, velocity and frequency of electrons. |
| **Week 2** | Normal excited and ionized atoms, kinetic and potential energy of electron, modern concept of atomic model. |
| **Week 3** | DeBroglie wave, wavelength of electron wave, concept of standing wave, electron configuration. |
| **Week 4** | Electrical properties of materials, electric conduction, electron mobility, electrical conductivity  |
| **Week 5** | Electronic and ionic conduction, band structure in solid, resistivity of metals. |
| **Week 6** | Influence of temperature, influence of impurities, influence of plastic deformation. |
| **Week 7** | Thermal properties of materials, heat capacity, theoretical models, Thermal expansion, thermal conductivity, refractories. |
| **Week 8** | Midterm Exam |
| **Week 9** | Thermal stresses, thermal fatigue, thermal shock, melting point. |
| **Week 10** | Optical properties of materials, interactions of light with solid. |
| **Week 11** | Atomic and electronic interactions, optical properties of metals. |
| **Week 12** | Optical properties of non – metals, applications of optical phenomena. |
| **Week 13** | Introduction to magnetic materials, concept of magnetism. |
| **Week 14** | Classification, Dia-, Para-, Ferro-, Antiferro- and Ferri – magnetic materials. |
| **Week 15** | Influence of temperature on magnetic behavior, Domains and Hysteresis, magnetic anisotropy applications in storage devices. |
| **Week 16** | **Preparatory week before the final Exam** |

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| **Learning and Teaching Resources****مصادر التعلم والتدريس** |
|  | **Text** | **Available in the Library?** |
| **Required Texts** | S.L.KAKANI and AMIT KAKANI, “ Material Science” (2004) | Yes |
| **Recommended Texts** | 1) William D. Callister and David G. Rethwisch, “Materials Science and Engineering” an introduction, John Wiley & Sons, 8th edition (2010).2) K.M.Gupta and Nishu Gupta, “ Advanced Electrical and Electronic Materials” John & Sons, (2015). | No |
| **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. |