

وزارة التعليم العالي والبحث العلمي  
جهاز الإشراف والتقييم العلمي  
دائرة ضمان الجودة والاعتماد الأكاديمي

## استمارة وصف البرنامج الأكاديمي للكليات والمعاهد

الجامعة: ديالى

الكلية \ المعهد: الهندسة

القسم العلمي: هندسة الاتصالات

تاريخ ملئ الملف: 18/9/2023



التوقيع:

اسم المعاون العلمي: أ.م.د. جبار قاسم جبار

التاريخ: 19/9/2023



التوقيع:

اسم رئيس القسم: أ.م.د. محمد سلطان صالح

التاريخ: 18/9/2023

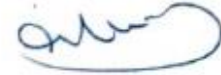
دقق الملف من قبل

قسم ضمان الجودة والأداء الجامعي

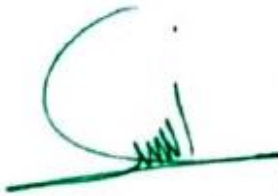
اسم مدير قسم ضمان الجودة والأداء الجامعي:

التاريخ: 19/9/2023

أ.د. صلاح نور الدين زهران



التوقيع



مصادقة السيد العميد

أ.د. ابنه عبد الله قاسم





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Scientific Research - Iraq  
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College of Engineering  
Department of Communications Engineering



## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

| Module Information                 |                      |                               |  |
|------------------------------------|----------------------|-------------------------------|--|
| معلومات المادة الدراسية            |                      |                               |  |
| Module Title                       | Physical Electronics |                               | Module Delivery  |
| Module Type                        | Core                 |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> L Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | COE104               |                               |  |
| ECTS Credits                       | 6                    |                               |  |
| SWL (hr/sem)                       | 150                  |                               |  |
| Module Level                       | UGI                  | Semester of Delivery          |  |
| Administering Department           | Bsc. - COMM          | College                       | College of Engineering   |
| Module Leader                      |                      | e-mail                        |  |
| Module Leader's Acad. Title        |                      | Module Leader's Qualification |  |
| Module Tutor                       | Name (if available)  | e-mail                        | E-mail   |
| Peer Reviewer Name                 | Name                 | e-mail                        | E-mail   |
| Scientific Committee Approval Date | 15/06/2023           | Version Number                | 1.0  |

| 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

|  |   |
|--|---|
| <p><b>Module Objectives</b><br/>أهداف المادة الدراسية</p>                | <p>1-During the school year, the student learns an idea about the atomic structure, energy levels, and conductivity of minerals</p> <p>2- The student will be introduced to semiconductors and diodes, their types and applications in the field of communication science, and an understanding of electronic circuits and the most important electronic elements included in the designs of these circuits.</p> <p>3- The study material aims to develop the student's mind and enable him to visualize the transmission of information and the foundations of establishing various electrical circuits.</p> <p>4- Teaching this subject is the consolidation of the theoretical principles and foundations that depend on the creation of any electronic electrical circuit and its absolute understanding.</p>   |
| <p><b>Module Learning Outcomes</b><br/>مخرجات التعلم للمادة الدراسية</p> | <p>This course is intended for teaching the basic principle of electronic physical for engineering students at the beginning graduate level. The course will have these important outcomes:</p> <ol style="list-style-type: none"> <li>(1) Understanding Energy Levels and Atomic Structure ;</li> <li>(2) Recognize how electricity works in electrical circuits.</li> <li>(3) List the various terms associated with electrical circuits.</li> <li>(4) Discuss the reaction and involvement of atoms in electric circuits.</li> <li>(5) Describe electrical conductivity, charge, and current.</li> <li>(6) Define Ohm's law.</li> <li>(7) Learn and understand the basics of transmitting electromagnetic signals through different mediums</li> <li>(8) Learn and understand the basics of creating electrical waves</li> <li>(9) Understanding the operating principle of Semiconductor , P-N Junction</li> <li>(10) the students will learn Rectifiers ,and its types</li> <li>(11) Explain the diode Circuit Applications and other Types of Semiconductor Diodes; such as zener diodes voltage regulators , clipping circuits , clamping circuits and wave form generation ,</li> <li>(12) Understanding the waveform change of diode clipping and clamping circuits and Calculate and explain DC current-voltage behaviour of diodes and BJTs</li> </ol> |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p>                | <p><b>Part A</b> - The atom models , wave nature of light , dual nature of matter, energy – band theory of metals , insulators and Semiconductors and explain the influence of excess minority carrier recombination of the performance of the devices.( 7 hrs)</p> <p><b>Part B</b>- p-n junction in equilibrium , current-voltage characteristics , charge control decryption of a diode transition and diffusion capacitance , diode switching Times, diode models, small-signal model and load line concept .(12 hrs)</p>   |



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**Part c-**, the students will learn Rectifiers , zener diodes voltage regulators , clipping circuits , clamping circuits and wave form generation ,Varactor diode, tunnel diode, photodiode and photovoltaic (solar)cell, Light Emitting diode, principle and operation of semiconductor laser, metal Electronic Palasisics semiconductor diode. On the last objective explain the waveform change of diode clipping and clamping circuits and the function of each one.(10 hrs)

### Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

#### Strategies

- 1-Encourage the student to think about ways of generating the electromagnetic wave
- 2- Encourage the student to think about the importance of the frequency and energy of the wave and the time periods.
- 3- 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.
- 4- Urge the student to think about the factors affecting wave transmission in the media.
- 5- Enable students to link theories to the practical reality of electrical circuits.
- 6- Enable students to pass professional exams organized by local or international bodies.
- 7- Enabling students to continue self-development after graduation.
- 8- Setting up special seminars for students for the purpose of self-development of their personalities.

### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|  |            |   |     |
|--|------------|---|-----|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 78         | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 5   |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 72         | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4.8 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | <b>150</b> |   |     |



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### Module Evaluation

تقييم المادة الدراسية

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

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|        | Material Covered   |
|--------|--|
| Week 1 | <b>The models of atoms</b> :Explain the models of atoms and the mathematical equations of each model   |
| Week 2 | <b>Dual nature of matter</b> : Studying the dual nature of light and their mathematical relations, especially electromagnetic waves  |
| Week 3 | <b>Energy-band theory of metals Insulators and Semiconductors</b> : The theory of energy bands in conductors, insulators and semiconductors and the difference between them                            |
| Week 4 | <b>Internal structure of materials cell packing</b> : Internal arrangement of various materials Metals, insulators and semiconductors  |
| Week 5 | <b>Bragg's law and x-ray diffraction</b> : The importance of Bragg's law in the study of x-ray diffraction   |
| Week 6 | <b>electronic ballistics, Hall effect</b> <b>electronic ballistics</b> , Hall effect: The effect of electric and magnetic fields on electron movement and the Hall effect                              |
| Week 7 | <b>Mobility and conduction ,energy distribution of electrons</b> : Mobility, conductivity and energy distribution study of semiconductors  |
| Week 8 | <b>Diffusion and drift motion and Carrier life time</b> : Explanation of the phenomena of diffusion and drift  |
| Week 9 | <b>semiconductors materials</b> : Fermi-level in semiconductor: Semiconductor materials and Fermi level study of these materials and Study the types of semiconductors and the difference between them |



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|                |  |
|----------------|--|
| <b>Week 10</b> | <b>p-n junction in equilibrium, current-voltage characteristics:</b> Studying the P-N junction and its voltage and current characteristics                     |
| <b>Week 11</b> | <b>Small-signal model and load line concept:</b> Studying the model of the minimum signal and the concept of the load line                                     |
| <b>Week 12</b> | <b>Rectifiers and the types of rectifiers :</b> Study the rectifier and its types  |
| <b>Week 13</b> | <b>Types of Diodes:</b> study the types of diodes used in electrical circuits, especially communication circuits, and the characteristics of each of them      |
| <b>Week 14</b> | <b>Clipping circuits and wave form generation:</b> Study clipping circles and clamping circles, And configure the output waveform through circuit applications |
| <b>Week 15</b> | <b>Transistor biasing PNP, NPN, FET:</b> A study of the types of transistor bias PNP, NPN, FET   |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>  |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text  | Available in the Library? |
|--------------------------|---|---------------------------|
| <b>Required Texts</b>    | Electrical and magnetic properties of materials Electrical and magnetic properties of materials   | Yes                       |
| <b>Recommended Texts</b> | 1. M.S. Tyagi, Introduction to Semiconductor Materials and Devices, Wiley & Sons<br>2. S.M. Sze, Semiconductor Devices, Wiley & Sons  | No                        |
| <b>Websites</b>          | <a href="https://www.coursera.org/browse/physical-science-and-engineering/physical">https://www.coursera.org/browse/physical-science-and-engineering/physical</a> electronics |                           |

### Grading Scheme

مخطط الدرجات

| Group | Grade | التقدير | Marks % | Definition |
|-------|-------|---------|---------|------------|
|-------|-------|---------|---------|------------|



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|                                     |                         |                     |          |                                       |
|-------------------------------------|-------------------------|---------------------|----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A - Excellent</b>    | امتياز              | 90 - 100 | Outstanding Performance               |
|                                     | <b>B - Very Good</b>    | جيد جدا             | 80 - 89  | Above average with some errors        |
|                                     | <b>C - Good</b>         | جيد                 | 70 - 79  | Sound work with notable errors        |
|                                     | <b>D - Satisfactory</b> | متوسط               | 60 - 69  | Fair but with major shortcomings      |
|                                     | <b>E - Sufficient</b>   | مقبول               | 50 - 59  | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX – Fail</b>        | راسب (قيد المعالجة) | (45-49)  | More work required but credit awarded |
|                                     | <b>F – Fail</b>         | راسب                | (0-44)   | Considerable amount of work required  |
|                                     |                         |                     |          |                                       |

**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.