

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                      |                               |                                                                                                                                                                                                                                          |                          |
|------------------------------------|----------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| معلومات المادة الدراسية            |                      |                               |                                                                                                                                                                                                                                          |                          |
| Module Title                       | Signal and System    |                               | Module Delivery                                                                                                                                                                                                                          |                          |
| Module Type                        | Core                 |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                          |
| Module Code                        | ATU11302             |                               |                                                                                                                                                                                                                                          |                          |
| ECTS Credits                       | 6                    |                               |                                                                                                                                                                                                                                          |                          |
| SWL (hr/sem)                       | 150                  |                               |                                                                                                                                                                                                                                          |                          |
| Module Level                       | UGII                 | Semester of Delivery          |                                                                                                                                                                                                                                          | 1                        |
| Administering Department           |                      | College                       | NETC                                                                                                                                                                                                                                     |                          |
| Module Leader                      | Ahmad H. Hadi        |                               | e-mail                                                                                                                                                                                                                                   | Coj.Ahmadhadi@atu.edu.iq |
| Module Leader's Acad. Title        | Lecturer             | Module Leader's Qualification | M.Sc.                                                                                                                                                                                                                                    |                          |
| Module Tutor                       | Name (if available)  |                               | e-mail                                                                                                                                                                                                                                   | E-mail                   |
| Peer Reviewer Name                 | Nasir Hussein Selman |                               | e-mail                                                                                                                                                                                                                                   | Coj.nas@atu.edu.iq       |
| Scientific Committee Approval Date | 1/10/2024            | Version Number                | 1.0                                                                                                                                                                                                                                      |                          |

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

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br><b>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives</b><br><b>أهداف المادة الدراسية</b>                                                                         | <ol style="list-style-type: none"> <li>1. Define the basics of signals in real-life.</li> <li>2. Determine the circuit response to a periodic signal using the Fourier Series. Model linear time-invariant systems using convolution.</li> <li>3. Describe how composite signals are used to determine the response of linear systems)</li> <li>4. To understand the power and energy of signals.</li> <li>5. Demonstrate what happens in the frequency domain when a continuous signal is sampled.</li> <li>6. Design an anti-alias filter for a sampled data system.</li> <li>7. Utilize the z-Transform to describe a discrete-time signal.</li> <li>8. Understanding the representation signals using (Time/Frequency) domains</li> </ol> |
| <b>Module Learning Outcomes</b><br><b>مخرجات التعلم للمادة الدراسية</b>                                                          | <ol style="list-style-type: none"> <li>1. Understand the main signal and recognize different types of signals and systems.</li> <li>2. Have the ability to Understand Signals operations.</li> <li>3. Understanding the convolution and correlation operations.</li> <li>4. Have the ability to design Filters.</li> <li>5. Have the ability to representation of the signals in time/frequency- domains.</li> </ol>                                                                                                                                                                                                                                                                                                                          |
| <b>Indicative Contents</b><br><b>المحتويات الإرشادية</b>                                                                         | <p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1. Signals and Systems. (6 hrs).</li> <li>2. Fourier Series and Fourier Transform (6 hrs).</li> <li>2. Filters (3 hrs).</li> <li>3. Convolution and Correlation (6 hrs).</li> <li>4. Noise (9 hrs).</li> <li>6. Sampling (9 hrs).</li> <li>7. Transmission lines (6 hrs).</li> </ol>                                                                                                                                                                                                                                                                                                                                                                 |

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>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.</p> |

| Student Workload (SWL)                                                         |     |                                                                           |               |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---------------|
| الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا                                        |     |                                                                           |               |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطلاب خلال الفصل       | 78  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطلاب أسبوعيا       | 78/15=<br>5.2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 72  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 72/15=<br>4.8 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 150 |                                                                           |               |

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

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                                                                                                                                                                                                                  |
|                                 | Material Covered                                                                                                                                                                                                                                                                 |
| Week 1-5                        | Signals and Systems, spectrum, and filters; Singularity functions; periodic signals and Fourier series; nonperiodic signals and Fourier transform. convolution and impulses system response and filters; correlation and spectral density; Parseval's theorem for energy signals |
| Week 6-8                        | Noise: Band-limited white noise; thermal noise; noise figure.                                                                                                                                                                                                                    |
| Week 9                          | Mid-term Exam                                                                                                                                                                                                                                                                    |
| Week 10-12                      | Sampling: sampling theory and practice, aliasing.                                                                                                                                                                                                                                |
| Week 13-15                      | Transmission lines: characteristic impedance, reflection coefficient and standing waves                                                                                                                                                                                          |
| Week 16                         | Final exam                                                                                                                                                                                                                                                                       |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المناهج الاسبوعي للمختبر |                                                                        |
|-------------------------------------------------------------------------|------------------------------------------------------------------------|
|                                                                         | Material Covered                                                       |
| <b>Week 1</b>                                                           | Introducing laboratory equipment and their operation.                  |
| <b>Week 2-3</b>                                                         | Low pass filter and high pass filter (passive)                         |
| <b>Week 4&amp;5</b>                                                     | Signals operations using RLC circuits and responses                    |
| <b>Week 6&amp;7</b>                                                     | band pass filter and band reject filter                                |
| <b>Week 8-9</b>                                                         | Filter design: First order and second order filter design              |
| <b>Week 10</b>                                                          | Midterm exam                                                           |
| <b>Week 11-12</b>                                                       | Oscillator's operation, Hartley oscillator, voltage control oscillator |
| <b>Week 13</b>                                                          | Signal analysis using oscilloscope                                     |
| <b>Week 14</b>                                                          | sampling of signals circuits                                           |
| <b>Week 15</b>                                                          | Aliasing proofing                                                      |
| <b>Week 16</b>                                                          | Final exam                                                             |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                               |                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                                 | Text                                                                                                                                          | Available in the Library? |
| <b>Required Texts</b>                                           | "Introduction to Communication Systems" By F. G. Strelmer                                                                                     | No                        |
| <b>Recommended Texts</b>                                        | Sanjay Sharma: "Communication Systems (Analog and Digital)<br>T. R. Ganesh Babu, and G. Srinivasan: " Communication Theory and systems", 2006 | No                        |
| <b>Websites</b>                                                 |                                                                                                                                               |                           |

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