



## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

| Module Information                 |                            |                               |                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                            |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Probability and Statistics |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                       |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CYS113                     |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 2                          |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 50                         |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 1                          | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | Dept. of Cybersecurity     | College                       | College of Information Technology                                                                                                                                                                                                        |
| Module Leader                      | Mufeed Hameed Saleh        | e-mail                        | <a href="mailto:Mufeed.h@uofallujah.edu.iq">Mufeed.h@uofallujah.edu.iq</a>                                                                                                                                                               |
| Module Leader's Acad. Title        | Assistant lecturer         | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |
| Module Tutor                       | Mufeed Hameed Saleh        | e-mail                        | <a href="mailto:Mufeed.h@uofallujah.edu.iq">Mufeed.h@uofallujah.edu.iq</a>                                                                                                                                                               |
| Peer Reviewer Name                 | Dr. Ahmad A. AlSabhany     | e-mail                        | <a href="mailto:Ahmad.alsabhany@uofallujah.edu.iq">Ahmad.alsabhany@uofallujah.edu.iq</a>                                                                                                                                                 |
| Scientific Committee Approval Date | 25-5-2026                  | Version Number                | 1.0                                                                                                                                                                                                                                      |

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Objectives</b><br/>أهداف المادة الدراسية</p>                | <ol style="list-style-type: none"> <li>1. To introduce students to the fundamental laws and principles of probability and statistics.</li> <li>2. To enable students to organize, describe, and analyze data effectively.</li> <li>3. To provide understanding of data distribution, variation, and correlation.</li> <li>4. To develop the ability to compute and interpret measures of central tendency and dispersion.</li> <li>5. To introduce the concepts of permutations, combinations, and counting principles.</li> <li>6. To equip students with knowledge of probability rules, theorems, and common probability distributions.</li> <li>7. To provide the foundation for further study in data analysis, engineering, and computer science applications.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p><b>Module Learning Outcomes</b><br/>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. Understand the basic terminology and principles of probability and statistics.</li> <li>2. Identify and classify data types, organize data, and present it graphically.</li> <li>3. Apply the concepts of permutations, combinations, and basic counting rules.</li> <li>4. Solve problems involving sample spaces, events, and probability laws.</li> <li>5. Compute measures of central tendency and dispersion, and interpret their meaning.</li> <li>6. Apply key probability distributions such as binomial, Poisson, and normal distributions.</li> <li>7. Use correlation and regression to study relationships between variables.</li> <li>8. Demonstrate understanding of sampling, estimation, and hypothesis testing.</li> <li>9. Apply learned techniques in problem-solving and data-driven reasoning.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><b>Part A – Statistics</b></p> <ol style="list-style-type: none"> <li>1. Population, samples, and types of sampling. Random and continuous variables. (6)</li> <li>2. Frequency distribution, data organization, and graphical representation (histograms, charts). (8)</li> <li>3. Measures of central tendency: mean, median, mode. (8)</li> <li>4. Measures of variation: range, variance, standard deviation, coefficient of variation. (10)</li> <li>5. Correlation and regression analysis. (8)</li> <li>6. Sampling, estimation, and confidence intervals. (10)</li> <li>7. Hypothesis testing and data interpretation. (10)</li> </ol> <p><b>Part A – Statistics (65 hours)</b></p> <p><b>Part B – Probability</b></p> <ol style="list-style-type: none"> <li>1. Fundamental concepts: sample space, events, probability rules. (6)</li> <li>2. Venn and tree diagrams, addition and multiplication theorems. (6)</li> <li>3. Counting principles: factorial, permutations, combinations. (8)</li> <li>4. Conditional probability and Bayes' theorem. (8)</li> <li>5. Discrete probability distributions: binomial, multinomial, Poisson. (10)</li> <li>6. Continuous probability distributions: uniform, normal, exponential. (10)</li> <li>7. Applications and interpretation of probability models. (6)</li> </ol> |

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### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                                    |                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b><br>الاستراتيجيات | The main teaching strategy involves interactive lectures, exercises, and practical examples to strengthen analytical and problem-solving skills. Students are encouraged to participate actively in discussions and to apply concepts through class activities, tutorials, and exercises. Visualization and numerical examples are used to clarify statistical and probabilistic concepts. |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا

|                                                                                |    |                                                                           |   |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطلاب خلال الفصل       | 32 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطلاب أسبوعيا       | 2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 18 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 1 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 50 |                                                                           |   |

### Module Evaluation

#### تقييم المادة الدراسية

|                             |              | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
|-----------------------------|--------------|-------------|------------------|----------|---------------------------|
| <b>Formative assessment</b> | Quiz         | 1           | 10% (10)         | 5        | LO #1, #2, #3             |
|                             | Assignments  | 2           | 10% (10)         | 2 and 12 | LO #3, #4 and #6, #7      |
|                             | Quiz         | 1           | 10% (10)         | 12       | LO #8, #9, #10            |
|                             | Report       | 1           | 10% (10)         | 13       | LO #5, #11 and #12        |
| <b>Summative assessment</b> | Midterm Exam | 2hr         | 10% (10)         | 7        | LO #1 - #7                |
|                             | Final Exam   | 3hr         | 50% (50)         | 16       | All                       |
| <b>Total assessment</b>     |              |             | 100% (100 Marks) |          |                           |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|               | Material Covered                                              |
|---------------|---------------------------------------------------------------|
| <b>Week 1</b> | Population, samples, random variables, and data organization. |

## Learning and Teaching Resources

مصادر التعلم والتدريس

|                   |                                                                                       | Text                                                                                                                                                                                                                               | Available in the Library? |
|-------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Required Texts    |                                                                                       | 1. Walpole, R. E., et al. (2020). Probability and Statistics for Engineers and Scientists. 10th Edition.                                                                                                                           | Yes                       |
|                   |                                                                                       | 2. Larson, R., & Farber, B. (2022). Elementary Statistics: Picturing the World. 8th Edition.                                                                                                                                       |                           |
|                   |                                                                                       | 3. Montgomery, D. C., & Runger, G. C. (2018). Applied Statistics and Probability for Engineers.                                                                                                                                    |                           |
| Recommended Texts |                                                                                       | 1. Blom, G. (2019). Probability and Statistics: Theory and Applications.                                                                                                                                                           | No                        |
|                   |                                                                                       | 2. Online educational resources for probability and statistics visualization and problem-solving.                                                                                                                                  |                           |
| Websites          |                                                                                       | <a href="https://www.khanacademy.org/math/statistics-probability">https://www.khanacademy.org/math/statistics-probability</a><br><a href="https://www.itl.nist.gov/div898/handbook/">https://www.itl.nist.gov/div898/handbook/</a> |                           |
| Week 2            | Frequency distribution and histograms.                                                |                                                                                                                                                                                                                                    |                           |
| Week 3            | Measures of central tendency (mean, median, mode).                                    |                                                                                                                                                                                                                                    |                           |
| Week 4            | Measures of variation (variance, standard deviation).                                 |                                                                                                                                                                                                                                    |                           |
| Week 5            | Coefficient of variation, correlation, and regression.                                |                                                                                                                                                                                                                                    |                           |
| Week 6            | Introduction to probability, sample space, and events.                                |                                                                                                                                                                                                                                    |                           |
| Week 7            | Venn and tree diagrams, addition and multiplication theorems. + <b>(Midterm Exam)</b> |                                                                                                                                                                                                                                    |                           |
| Week 8            | Counting techniques: factorial, permutations, combinations.                           |                                                                                                                                                                                                                                    |                           |
| Week 9            | Conditional probability and Bayes’ theorem.                                           |                                                                                                                                                                                                                                    |                           |
| Week 10           | Discrete probability distributions – binomial and Poisson.                            |                                                                                                                                                                                                                                    |                           |
| Week 11           | Continuous distributions – uniform and normal.                                        |                                                                                                                                                                                                                                    |                           |
| Week 12           | Exponential distribution and expected values.                                         |                                                                                                                                                                                                                                    |                           |
| Week 13           | Sampling and estimation concepts.                                                     |                                                                                                                                                                                                                                    |                           |
| Week 14           | Hypothesis testing and data interpretation.                                           |                                                                                                                                                                                                                                    |                           |
| Week 15           | Review and discussion                                                                 |                                                                                                                                                                                                                                    |                           |
| Week 16           | preparation for final exam.                                                           |                                                                                                                                                                                                                                    |                           |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                  |                     |          |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks %  | Definition                            |
| Success Group<br>(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<br>(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  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |          |                                       |
| <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. |                  |                     |          |                                       |