



## Academic Course Specification Form

استمارة توصيف المقرر الأكاديمي

### القسم الخاص بالطالب Section Concerning the Student

|                                           |                                                                                                                                                            |                                                              |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| 1. Course Code:                           | <b>ITCS258</b>                                                                                                                                             | 1. رمز المقرر:                                               |
| 2. Course Title                           | Discrete Structures                                                                                                                                        | 2. اسم المقرر:                                               |
| 3. College:                               | Information Technology                                                                                                                                     | 3. الكلية:                                                   |
| 4. Department:                            | Computer Science                                                                                                                                           | 4. القسم:                                                    |
| 5. Academic Program:                      | B.Sc. in Computer Science<br>B.Sc. in Software Engineering                                                                                                 | 5. البرنامج الأكاديمي:                                       |
| 6. Course Credits:                        | 3-0-3                                                                                                                                                      | 6. عدد الساعات المعتمدة:                                     |
| 7. Course NQF Level:                      | 6                                                                                                                                                          | 7. مستوى المقرر وفقاً للإطار الوطني للمؤهلات:                |
| 8. Notional Hours:                        | 118                                                                                                                                                        | 8. عدد الساعات الافتراضية:                                   |
| 9. NQF Credits:                           | 12                                                                                                                                                         | 9. عدد الساعات المعتمدة للمقرر وفقاً للإطار الوطني للمؤهلات: |
| 10. Prerequisite:                         | ITCS106, MATHS 101                                                                                                                                         | 10. المتطلب السابق للمقرر:                                   |
| 11. Lectures Timing & Location:           | Section 1: UTH 08:00 – 08:50 S40-049<br>Section 2: UTH 11:00 – 11:50 S40-049<br>Section 7: MW 13:00 – 14:15 S40-049<br>Section 8: UT 13:00 – 13:50 S40-049 | 11. وقت المحاضرة ومكانها:                                    |
| 12. General Mode of Teaching and Learning | تقليدي Traditional                                                                                                                                         | 12. النمط العام للتعليم والتعلم:                             |

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University of Bahrain – Quality Assurance & Accreditation Center - Academic Course Specification Form  
December 2025

Changing any elements of the form is strictly prohibited.  
يرجى عدم تغيير أي عنصر من عناصر الاستمارة

|                                                                                                                                                                                                                                |                                                                                                      |                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------|
| 13. Course Coordinator:                                                                                                                                                                                                        | Dr. Muhammad Mazin Al Maathidi                                                                       | 13. منسق المقرر:              |
| 14. Course Instructor:                                                                                                                                                                                                         | Dr. Ali Alsaffar                                                                                     | 14. مدرّس المقرر:             |
| 15. Office Hours and Location:                                                                                                                                                                                                 |                                                                                                      | 15. الساعات المكتبية ومكانها: |
| 16. Instructor's Email:                                                                                                                                                                                                        | aalsaffar@uob.edu.bh                                                                                 | 16.                           |
| 17. Academic Year:                                                                                                                                                                                                             | 2026-2027                                                                                            | 17. السنة الأكاديمية:         |
| 18. Semester:                                                                                                                                                                                                                  | First Semester الفصل الأول                                                                           | 18. الفصل الدراسي:            |
| 19. Changes introduced to the course based on the results of the Course Evaluation Surveys (where applicable):                                                                                                                 | 19. التغييرات التي أُدخلت على المقرر استناداً إلى نتائج استبانات تقييم المقررات الدراسية (إن وُجدت): |                               |
| Updated PowerPoint Slides                                                                                                                                                                                                      |                                                                                                      |                               |
| 20. Textbook(s):                                                                                                                                                                                                               | 20. الكتب الدراسية للمقرر:                                                                           |                               |
| Rosen, Kenneth H., Discrete Mathematics and Its Applications, 8th Edition, McGraw-Hill, 2019                                                                                                                                   |                                                                                                      |                               |
| 21. References:                                                                                                                                                                                                                | 21. المراجع:                                                                                         |                               |
| <ul style="list-style-type: none"> <li>• Susanna S. Epp, Discrete Mathematics with Applications, 5th edition, Cengage, 2020</li> <li>• Richard Johnsonbaugh, Discrete mathematics, 8th edition, Prentice Hall, 2018</li> </ul> |                                                                                                      |                               |
| 22. Other Learning Resources Used (e.g. e-learning, field visits, periodicals, software, etc.):                                                                                                                                | 22. مصادر التعلّم الأخرى (مثال: التعلّم الإلكتروني، زيارات ميدانية، دوريات، برمجيات، إلخ....)        |                               |
| PowerPoint Slides, MS Teams, Blackboard.                                                                                                                                                                                       |                                                                                                      |                               |
| 23. Course Description (as published in the College Catalogue):                                                                                                                                                                | 23. توصيف المقرر (حسب ما ورد في دليل الكلية):                                                        |                               |
| This course covers basic discrete structures that are the backbones of computer science. Topics include logic, predicate calculus, proofs, sets, relations, recurrence relations, graphs, and trees.                           |                                                                                                      |                               |
| 24. Course Intended Learning Outcomes (3 to 5 CILOs):                                                                                                                                                                          | 24. مخرجات التعلّم للمقرر (CILOs) (3 إلى 5 مخرجات تعليمية):                                          |                               |
| 1. Apply logic and predicates to relate knowledge.                                                                                                                                                                             |                                                                                                      |                               |
| 2. Apply proof techniques to solve mathematical problems.                                                                                                                                                                      |                                                                                                      |                               |
| 3. Explain properties of relations and relate equivalence relations.                                                                                                                                                           |                                                                                                      |                               |
| 4. Solve problems involving recurrence relations.                                                                                                                                                                              |                                                                                                      |                               |
| 5. Explain the basic properties and concepts of graphs and trees.                                                                                                                                                              |                                                                                                      |                               |

| 25. Course Assessment Percentages (as per Regulations of Study and Examination at the University of Bahrain): |                 |                                       | 25. أساليب التقييم ونسبها المئوية (بحسب نظام الدراسة والامتحانات في جامعة البحرين):                                                                                                                         |                                                                       |
|---------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Assessment<br>التقييم                                                                                         |                 | Type<br>النوع                         | Percentage<br>النسبة                                                                                                                                                                                        | Assessment Date<br>تاريخ التقييم                                      |
| Midterm 1                                                                                                     |                 | Individual<br>فردى                    | 20%                                                                                                                                                                                                         | TBA                                                                   |
| Midterm 2                                                                                                     |                 | Individual<br>فردى                    | 20%                                                                                                                                                                                                         | TBA                                                                   |
| Quizzes (2)                                                                                                   |                 | Individual<br>فردى                    | 10%                                                                                                                                                                                                         | Weeks (4, 8)                                                          |
| Home Assignments (4)                                                                                          |                 | Individual<br>فردى                    | 10%                                                                                                                                                                                                         | Weeks (3, 6, 9, 12)                                                   |
| Final Exam                                                                                                    |                 | Individual<br>فردى                    | 40%                                                                                                                                                                                                         | 7 Jan 2027 (11:30-1:30)                                               |
| Total                                                                                                         |                 | 100%                                  |                                                                                                                                                                                                             |                                                                       |
| 26. Description of Topics Covered                                                                             |                 |                                       | 26. وصف الموضوعات التي ينبغي تناولها:                                                                                                                                                                       |                                                                       |
| Topic Title<br>(e.g. chapter/experiment title)<br>الموضوع                                                     |                 |                                       | Description<br>التفصيل                                                                                                                                                                                      |                                                                       |
| Propositional Logic and Logic of Predicates.<br>Chapter 1 (Sections 1.1, 1.3, 1.4 and 1.5).                   |                 |                                       | In the first, the propositional logic and its properties and applications are studied. Then the predicate calculus is introduced with many applications.                                                    |                                                                       |
| Arguments, proofs, and inductions proofs.<br>Chapter 1 (Sections 1.6, 1.7 and 1.8).                           |                 |                                       | Introduce the rules of inferences and its application to prove the correctness of the arguments. Then study proofs techniques such as direct, contraposition, contradiction proofs and proofs by induction. |                                                                       |
| Sets and their properties.<br>Chapter 2 (Sections 2.1 and 2.2).                                               |                 |                                       | The fundamental discrete structure on which all other discrete structures are built, namely, the set is introduced. Then the different applications of the sets is presented.                               |                                                                       |
| Recurrence Relations.<br>Chapter 8 (Section 8.2).                                                             |                 |                                       | Finding solutions to recurrence relations using varieties of methods and techniques.                                                                                                                        |                                                                       |
| Relations.<br>Chapter 9 (Sections 9.1 and 9.3)                                                                |                 |                                       | Determine properties of relations and inspect various types of relations such as equivalence and partial order relations                                                                                    |                                                                       |
| Graphs and Trees.<br>Chapter 10 (Sections 10.2 and 10.3) and Chapter 11 (Section 11.1).                       |                 |                                       | Introduction to graph theory. Study graphs, graph terminology, representing graphs and graph Isomorphism. Then, study trees, rooted trees and properties of trees.                                          |                                                                       |
| 27. Weekly Schedule                                                                                           |                 |                                       | 27. الجدول الأسبوعي                                                                                                                                                                                         |                                                                       |
| Week<br>الأسبوع                                                                                               | Date<br>التاريخ | Topics Covered<br>الموضوعات المتناولة | CILOs<br>مخرجات التعلم للمقرر                                                                                                                                                                               | Teaching/Assessment<br>Mode and Method<br>منهجية ونمط التدريس/التقييم |

|    |           |                                                                                                                                                    |   |                    |
|----|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------------|
| 1  | 13-Sep-23 | Chapter 1 Logic and Proofs 1.1: Propositional Logic                                                                                                | 1 | Traditional تقليدي |
| 2  | 20-Sep-23 | Chapter 1 Logic and Proofs 1.1: Propositional Logic                                                                                                | 1 | Traditional تقليدي |
| 3  | 27-Sep-23 | Chapter 1 Logic and Proofs 1.3: Propositional equivalences: truth table and identities.                                                            | 1 | Traditional تقليدي |
| 4  | 4-Oct-23  | Chapter 1 Logic and Proofs 1.4: Predicates and Quantifiers.                                                                                        | 1 | Traditional تقليدي |
| 5  | 11-Oct-23 | Chapter 1 Logic and Proofs 1.5: Nested Quantifiers.                                                                                                | 1 | Traditional تقليدي |
| 6  | 18-Oct-23 | Chapter 1 Logic and Proofs 1.6: Rules of Inference, Argument's validation: truth table, Inference Rules.                                           | 1 | Traditional تقليدي |
| 7  | 25-Oct-23 | Chapter 1 Logic and Proofs 1.7: Proofs Direct, contrapositive, counter example.                                                                    | 1 | Traditional تقليدي |
| 8  | 1-Nov-23  | Chapter 1 Logic and Proofs 1.7, 1.8: contradiction, proof by cases.                                                                                | 1 | Traditional تقليدي |
| 9  | 8-Nov-23  | Chapter 2 Basic Structures: Sets 2.1, 2.2: Set Notation, set operations, and cardinality. Prove set equivalence and subset.                        | 1 | Traditional تقليدي |
| 10 | 15-Nov-23 | Chapter 5 Mathematical Induction: 5.1: Mathematical Review (proofs on recurrence relations, properties of summations, properties of divisibility). | 1 | Traditional تقليدي |
| 11 | 22-Nov-23 | Chapter 8 Solving Recurrence Relations: 8.2: Solving Homogeneous and Nonhomogeneous Recurrence Relations with Constant Coefficients.               | 1 | Traditional تقليدي |
| 12 | 29-Nov-23 | Chapter 9 Relations: 9.1: Relations                                                                                                                | 1 | Traditional تقليدي |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           | properties. 9.3<br>Equivalence Relations.                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6-Dec-23  | Chapter 10 Graphs: Sec 10.2: Graph Terminology and Special Types of Graphs; 10.3: Representing Graphs and Graph Isomorphism. | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | تقليدي Traditional |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 13-Dec-23 | Chapter 11 Trees: 11.1: Introduction to Trees – Rooted Trees and Properties of Trees.                                        | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | تقليدي Traditional |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 20-Dec-23 | Revision                                                                                                                     | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | تقليدي Traditional |
| <b>28. Academic Integrity Statement</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |                                                                                                                              | <b>28. بيان النزاهة الأكاديمية</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |
| Students are to observe the highest level of honesty and academic ethics in pursuit of their academic goals as per UOB Regulations of Student Conduct and Academic Integrity, Anti-plagiarism Policies, and Students' Rights and Responsibilities Handbook ( <a href="#">available on the Bylaws, Regulations and Policies webpage</a> ). The consequences for cheating, plagiarism, unauthorized collaboration, and other forms of academic dishonesty can be very serious and will be dealt with as per the aforementioned policies and regulations. |           |                                                                                                                              | يتعين على الطلبة الالتزام بأعلى مستويات الصدق والأمانة والأخلاق الأكاديمية في سعيهم لتحقيق أهدافهم الأكاديمية وفقاً للوائح سلوك الطلاب والنزاهة الأكاديمية، وسياسات مكافحة الانتحال، ودليل حقوق الطلبة وواجباتهم، المعمول بها في جامعة البحرين ( <a href="#">والمتاحة على صفحة اللوائح والأنظمة والسياسات</a> ). يمكن لعواقب الغش والسرقة الأدبية والتعاون غير المصرح به وغيرها من أشكال عدم الأمانة الأكاديمية أن تكون خطيرة للغاية، وسيتم التعامل معها وفقاً للسياسات واللوائح المذكورة آنفاً. |                    |
| <b>29. Attendance and Absence Regulations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |                                                                                                                              | <b>29. نظام الحضور والغياب</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |
| Students are required to adhere to regular attendance for class lectures and practical sessions, as determined by the nature of the course, as per the Regulations of Study and Examination at the University of Bahrain, ( <a href="#">available on the Bylaws, Regulations and Policies webpage</a> ).                                                                                                                                                                                                                                               |           |                                                                                                                              | يجب على الطلبة الالتزام بالحضور المنتظم للمحاضرات الصفية والعملية، حسبما تحدده طبيعة المقرر الدراسي، وذلك وفقاً لنظام الدراسة والامتحانات في جامعة البحرين، <a href="#">والمتاح على صفحة اللوائح والأنظمة والسياسات</a> .                                                                                                                                                                                                                                                                        |                    |