

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                              |                               |                                                                                                                                                                                                                                                     |
|------------------------------------|------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                              |                               |                                                                                                                                                                                                                                                     |
| Module Title                       | <b>Compiler Construction</b> |                               | Module Delivery                                                                                                                                                                                                                                     |
| Module Type                        | Core                         |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" 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                        | <b>CS308</b>                 |                               |                                                                                                                                                                                                                                                     |
| ECTS Credits                       | 6                            |                               |                                                                                                                                                                                                                                                     |
| SWL (hr/sem)                       | 150                          |                               |                                                                                                                                                                                                                                                     |
| Module Level                       | 1                            | Semester of Delivery          |                                                                                                                                                                                                                                                     |
| Administering Department           | CS                           | College                       | Science                                                                                                                                                                                                                                             |
| Module Leader                      |                              | e-mail                        | 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 | 01/06/2023                   | Version Number                | 1.0                                                                                                                                                                                                                                                 |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | CS208    |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <b>Module Aims</b><br>أهداف المادة الدراسية                      | 1- To understand and explain the main techniques and algorithms used in compilers.<br>2- To understand, design and implement a lexical analyzer.<br>3- To understand, design and implement a Syntax Analysis.<br>4- To understand, design and implement a parser.<br>5- To understand, design code generation schemes.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 1- Learn about compilers and interpreters.<br>2- Explain the main techniques and algorithms used in compilers.<br>3- Describe an application of regular expressions in lexical scanners.<br>4- Discuss the hand coded scanner and automatically generated a scanner.<br>5- Explain the formal definition of tokens.<br>6- Describe finite state automata.<br>7- Explain the revision of formal definition of grammars.<br>8- Explain BNF and EBNF.<br>9- Describe the Bottom $\rightarrow$ up and top $\rightarrow$ down parsing.<br>10- Explain tabular, recursive, and descent parsers.<br>11- Learn about error handling. 12- Describe the automatic generation of tabular parsers, symbol table. management, and the use of tools in support of the translation process. |

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|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Indicative Contents</b><br>المحتويات الإرشادية | 1- Introduction to Compilers: The role of language translation in the programming process;<br>2- Comparison of interpreters and compilers, language translation phases, machine dependent and machine independent aspects of translation, language translation as a software engineering activity<br>3- Lexical Analysis: Application of regular expressions in lexical scanners, hand coded scanner vs. automatically generated a scanner, formal definition of tokens<br>4- Implementation of finite state automata.<br>5- Syntax Analysis: Revision of formal definition of grammars, BNF and EBNF, Bottom – up, top – down parsing, ...<br>6- Parsers Implementation: automatic generation of tabular parsers, symbol table management, the use of tools in support of the translation process,<br>7- Project presentation1 |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | Employing these strategies can create a comprehensive and engaging learning experience in compiler construction module, such as lectures, interactive discussions, hands-on lab sessions, case studies, assignments, projects, guest lectures, online resources, assessments, group projects, and continuous support. |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب                            |     |                                                                             |   |
|----------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدرا ي س المنتظم للطالب خلال الفصل       | 77  | <b>Structured SWL (h/w)</b><br>الحمل الدرا ي س المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدرا ي س غري المنتظم للطالب خلال الفصل | 73  | <b>Unstructured SWL (h/w)</b><br>الحمل الدرا ي س غري المنتظم للطالب أسبوعيا | 6 |
| <b>Total SWL (h/sem)</b><br>الحمل الدرا ي س الك ي ل للطالب خلال الفصل            | 150 |                                                                             |   |

| <div>Module</div> <div>تقييم Evaluation</div> <div>المادة الدراسية</div> |                 |             |                  |            |                              |
|--------------------------------------------------------------------------|-----------------|-------------|------------------|------------|------------------------------|
|                                                                          |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome    |
| Formative assessment                                                     | Quizzes         | 2           | 10% (10)         | 5, 10      | LO #1,# 2,#3,#4, #11 and #11 |
|                                                                          | Assignments     | 2           | 10% (10)         | 2, 12      | LO #5,#7, and #8, #10        |
|                                                                          | Projects / Lab. | 1           | 10% (10)         | Continuous | All                          |
|                                                                          | Report          | 1           | 10% (10)         | 13         | LO # 6,#7, #8,#9             |
| Summative assessment                                                     | Midterm Exam    | 2 hr        | 10% (10)         | 7          | LO # 1-#7                    |
|                                                                          | Final Exam      | 2hr         | 50% (50)         | 16         | All                          |
| Total assessment                                                         |                 |             | 100% (100 Marks) |            |                              |

| <div>Delivery Plan (Weekly Syllabus)</div> <div>المنهاج الاسبوعي النظري</div> |                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                               | Material Covered                                                                                                                                                                                 |
| Week 1+2                                                                      | Introduction to Compilers: The role of language translation in the programming process;                                                                                                          |
| Week 3+4                                                                      | Comparison of interpreters and compilers, language translation phases, machine dependent and machine independent aspects of translation, language translation as a software engineering activity |
| Week 5                                                                        | Lexical Analysis: Application of regular expressions in lexical scanners,                                                                                                                        |
| Week 6                                                                        | Lexical Analysis: hand coded scanner vs. automatically generated a scanners                                                                                                                      |
| Week 7                                                                        | Lexical Analysis: formal definition of tokens                                                                                                                                                    |
| Week 8                                                                        | Implementation of finite state automata.                                                                                                                                                         |
| Week 9                                                                        | Syntax Analysis: Revision of formal definition of grammars,                                                                                                                                      |
| Week 10                                                                       | Syntax Analysis: BNF and EBNF;                                                                                                                                                                   |
| Week 11                                                                       | Syntax Analysis: Bottom up vs. top down parsing,                                                                                                                                                 |

|                |                                                                                                                                                      |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 12</b> | Syntax Analysis: tabular vs. recursive descent parsers,                                                                                              |
| <b>Week 13</b> | error handling,                                                                                                                                      |
| <b>Week 14</b> | Parsers Implementation: automatic generation of tabular parsers, symbol table management,<br>the use of tools in support of the translation process, |
| <b>Week 15</b> | Project presentation                                                                                                                                 |

| Delivery Plan (Weekly Lab. Syllabus) |                                                                                                                               |                           |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| المنهاج الاسبوعي للمختبر             |                                                                                                                               |                           |
|                                      | Material Covered                                                                                                              |                           |
| Week 1+2                             | Implementation of strings                                                                                                     |                           |
| Week 3+4+5                           | Implementation of regular expression and Finite state automata                                                                |                           |
| Week 6+7+8                           | Implementation of a lexical analyzer                                                                                          |                           |
| Week 9+10                            | Implementation of a symbol table                                                                                              |                           |
| Week 11+12+13                        | Implementation of a basic parser (3 weeks)                                                                                    |                           |
| Week 14+15                           | Design of a compiler for simple language (project)                                                                            |                           |
| Learning and Teaching Resources      |                                                                                                                               |                           |
| مصادر التعلم والتدريس                |                                                                                                                               |                           |
|                                      | Text                                                                                                                          | Available in the Library? |
| Required Texts                       | Aho, Alfred V. <i>Compilers: Principles, Techniques and Tools (for Anna University)</i> , 2/e. Pearson Education India, 2007. |                           |
| Recommended Texts                    | W. Appel, <i>Modern Compiler Implementation in Java</i> , Prentice Hall, 2002                                                 |                           |
| Websites                             |                                                                                                                               |                           |

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

|                                |                  |                      |         |                                       |
|--------------------------------|------------------|----------------------|---------|---------------------------------------|
|                                | 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           |
| <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.