

## Subject Description Form

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| <b>Subject Code</b>                                    | COMP2421   |  |
| <b>Subject Title</b>                                   | Computer Organization  |  |
| <b>Credit Value</b>                                    | 3  |  |
| <b>Level</b>   | 2  |  |
| <b>Pre-requisite /<br/>Co-requisite/<br/>Exclusion</b> |  |  |
| <b>Objectives</b>                                      | This subject is designed to provide students with an introductory but comprehensive knowledge on computer systems, computer organization, computer system architecture and assembly language programming.  |  |
| <b>Intended Learning Outcomes</b>                      | <p>Upon completion of the subject, students will be able to:</p> <p><i>Professional/academic knowledge and skills</i></p> <p>(a) understand the organization of a modern computer system and be able to relate them to real examples implemented in commercially successful products;</p> <p>(b) understand the internal organization of a computer system through practicing with an assembly language;</p> <p>(c) apply concepts and skills to solve real life problems using a low level programming language.</p> <p><i>Attributes for all-roundedness</i></p> <p>(d) provide framework for thinking about computer organization;</p> <p>(e) continue the lifetime learning necessary for staying at the forefront of computing systems development.</p> |  |
| <b>Subject Synopsis/<br/>Indicative Syllabus</b>       | Topic  |  |
|  | <p>1. Overview of computer systems<br/>Introduction to Information Technology; concepts of a digital system; overview of computer system structures; computer evolution and performance; different types of computer systems.</p>  |  |

|   | <p>2. Memory, I/O and storage devices<br/>Input and output devices; interconnecting system components; interfacing; buses; interrupts in I/O systems; standard bus interfaces; main memory; RAM; ROM; secondary storage; cache memory; virtual memory and operating systems support.</p> <p>3. Computer arithmetic<br/>Number systems; decimal system; binary system and arithmetic; octal and hexadecimal systems; BCD representation; conversion between representations; floating point representations.</p> <p>4. Boolean Algebra and logic networks<br/>Boolean algebra and networks; basic logical operations; derivation of logical expressions; logic gates; flip-flops; counters; half and full adders.</p> <p>5. CPU and assembly language<br/>Instruction sets, characteristics and functions; CPU structure and functions; reduced instruction set computers; assembler commands; program instructions; assembler and execution of programs; assembly language programming.</p>   |  |   |   |   |   |                                   |             |  |  |  |  |  |   |   |   |   |   |  |                         |     |   |  |  |   |  |  |                        |   |  |  |   |  |  |                            |   |   |   |   |   |  |
|---|---|--|---|---|---|---|-----------------------------------|-------------|--|--|--|--|--|---|---|---|---|---|--|-------------------------|-----|---|--|--|---|--|--|------------------------|---|--|--|---|--|--|----------------------------|---|---|---|---|---|--|
| <p><b>Teaching/Learning Methodology</b></p>                                   | <p>Lectures teach students on the main concepts of the course, together with comprehensive examples, and class questions and answers for easy understanding.</p> <p>Tutorials and lab sessions offer the opportunity for students to review the lecture materials through online exercises and also the use of programming tools to learn to program.</p> <p>Programming assignments will give students the opportunity to solve problems through implementation where they understand and practice on how programs can be written and compiled to run to complete certain tasks.</p> <p>Homework assignments help students to develop analytical and problem solving skills.</p>   |  |   |   |   |   |                                   |             |  |  |  |  |  |   |   |   |   |   |  |                         |     |   |  |  |   |  |  |                        |   |  |  |   |  |  |                            |   |   |   |   |   |  |
| <p><b>Assessment Methods in Alignment with Intended Learning Outcomes</b></p> | <table border="1"> <thead> <tr> <th data-bbox="493 1520 802 1682" rowspan="2">Specific assessment methods/tasks</th> <th data-bbox="802 1520 948 1682" rowspan="2">% weighting</th> <th colspan="5" data-bbox="948 1520 1450 1619">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th data-bbox="948 1619 1032 1682">a</th> <th data-bbox="1032 1619 1117 1682">b</th> <th data-bbox="1117 1619 1201 1682">c</th> <th data-bbox="1201 1619 1286 1682">d</th> <th data-bbox="1286 1619 1370 1682">e</th> <th data-bbox="1370 1619 1450 1682"></th> </tr> </thead> <tbody> <tr> <td data-bbox="493 1682 802 1787">1. Homework Assignments</td> <td data-bbox="802 1682 948 1967" rowspan="3">55%</td> <td data-bbox="948 1682 1032 1787">✓</td> <td data-bbox="1032 1682 1117 1787"></td> <td data-bbox="1117 1682 1201 1787"></td> <td data-bbox="1201 1682 1286 1787">✓</td> <td data-bbox="1286 1682 1370 1787"></td> <td data-bbox="1370 1682 1450 1787"></td> </tr> <tr> <td data-bbox="493 1787 802 1881">2. Online QA exercises</td> <td data-bbox="948 1787 1032 1881">✓</td> <td data-bbox="1032 1787 1117 1881"></td> <td data-bbox="1117 1787 1201 1881"></td> <td data-bbox="1201 1787 1286 1881">✓</td> <td data-bbox="1286 1787 1370 1881"></td> <td data-bbox="1370 1787 1450 1881"></td> </tr> <tr> <td data-bbox="493 1881 802 1967">3. Programming Assignments</td> <td data-bbox="948 1881 1032 1967">✓</td> <td data-bbox="1032 1881 1117 1967">✓</td> <td data-bbox="1117 1881 1201 1967">✓</td> <td data-bbox="1201 1881 1286 1967">✓</td> <td data-bbox="1286 1881 1370 1967">✓</td> <td data-bbox="1370 1881 1450 1967"></td> </tr> </tbody> </table> |  |   |   |   |   | Specific assessment methods/tasks | % weighting | Intended subject learning outcomes to be assessed (Please tick as appropriate) |  |  |  |  | a | b | c | d | e |  | 1. Homework Assignments | 55% | ✓ |  |  | ✓ |  |  | 2. Online QA exercises | ✓ |  |  | ✓ |  |  | 3. Programming Assignments | ✓ | ✓ | ✓ | ✓ | ✓ |  |
| Specific assessment methods/tasks   | % weighting   | Intended subject learning outcomes to be assessed (Please tick as appropriate) |   |   |   |   |                                   |             |  |  |  |  |  |   |   |   |   |   |  |                         |     |   |  |  |   |  |  |                        |   |  |  |   |  |  |                            |   |   |   |   |   |  |
|   |   | a  | b | c | d | e |                                   |             |  |  |  |  |  |   |   |   |   |   |  |                         |     |   |  |  |   |  |  |                        |   |  |  |   |  |  |                            |   |   |   |   |   |  |
| 1. Homework Assignments   | 55%   | ✓  |   |   | ✓ |   |                                   |             |  |  |  |  |  |   |   |   |   |   |  |                         |     |   |  |  |   |  |  |                        |   |  |  |   |  |  |                            |   |   |   |   |   |  |
| 2. Online QA exercises  |   | ✓  |   |   | ✓ |   |                                   |             |  |  |  |  |  |   |   |   |   |   |  |                         |     |   |  |  |   |  |  |                        |   |  |  |   |  |  |                            |   |   |   |   |   |  |
| 3. Programming Assignments  |   | ✓  | ✓ | ✓ | ✓ | ✓ |                                   |             |  |  |  |  |  |   |   |   |   |   |  |                         |     |   |  |  |   |  |  |                        |   |  |  |   |  |  |                            |   |   |   |   |   |  |

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|---|---|-------|----------|---|---|---|--|--|
|   | 4. Quizzes and midterms   |       | ✓        | ✓ | ✓ | ✓ |  |  |
|   | 5. Examination  | 45%   | ✓        | ✓ | ✓ | ✓ |  |  |
|   | Total   | 100 % |          |   |   |   |  |  |
|   | <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>All five items are relevant to the assessment of (a) understand the organization of a modern computer system and be able to relate them to real examples implemented in commercially successful products and (d) provide framework for thinking about computer organization;</p> <p>Programming exercises in assignments are used to assess programming skills in (b) understand the internal organization of a computer system through practicing with an assembly language; and (c) apply concepts and skills to solve real life problems using a low level programming language. The programming skills learnt can also help student in (e) continue the lifetime learning necessary for staying at the forefront of computing systems development.</p> <p>The quizzes and the examination are also used to assess the programming skills learnt (for items b, c).</p> |       |          |   |   |   |  |  |
| <b>Student Study Effort Expected</b>  | Class contact:  |       |          |   |   |   |  |  |
|   | ▪ Lecture   |       | 39 Hrs.  |   |   |   |  |  |
|   | ▪ Laboratory  |       | 13 Hrs.  |   |   |   |  |  |
|   | Other student study effort:   |       |          |   |   |   |  |  |
|   | ▪ Reading to understand the concepts  |       | 28 Hrs.  |   |   |   |  |  |
|   | ▪ Homework and Programming Assignments, online QA, and preparation for Quizzes and Final exam   |       | 27 Hrs.  |   |   |   |  |  |
|   | Total student study effort  |       | 107 Hrs. |   |   |   |  |  |
| <b>Reading List and References</b>  | Textbooks:  |       |          |   |   |   |  |  |
|   | 1. Stallings, W., Computer Organization and Architecture: Designing for Performance, Eighth Edition, Prentice Hall, 2009.   |       |          |   |   |   |  |  |
| Reference Books:  |   |       |          |   |   |   |  |  |
| 1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fourth Edition, Morgan Kaufmann, 2008. |   |       |          |   |   |   |  |  |
| 2. Mano, M.M. and Kime, C.R., Logic and Computer Design Fundamentals, Second Edition, Prentice Hall, 2000.  |   |       |          |   |   |   |  |  |
| 3. Hamacher, C., Vranesic, Z. and Zaky, S., Computer Organization,  |   |       |          |   |   |   |  |  |

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|  | <p>Fifth Edition, McGraw-Hill, 2002.</p> <ol style="list-style-type: none"><li data-bbox="537 142 1442 279">4. Barry B. Brey, The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro, and Pentium II Processors: Architecture, Programming, and Interfacing, Sixth Edition, Prentice Hall, 2003.</li><li data-bbox="537 285 1442 348">5. Antonakos, J.L., The 68000 Microprocessor, Fourth Edition, Prentice Hall, 1999.</li></ol> |
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