

Subject Description Form

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| Subject Code | COMP5532 |
| Subject Title | Digital Twins & Virtual Human |
| Credit Value | 3 |
| Level | 5 |
| Pre-requisite/ Co-requisite/ Exclusion | Nil (but knowledge in programming is preferable) |
| Objectives | This subject enables students to understand the basic concept of digital twins and how they work in the context of Metaverse. A variety of use cases of digital twins including manufacturing, automobile, retail, healthcare, and smart cities for Metaverse are to be introduced. In addition, this subject also enables students to understand how the virtual human characters are designed and built with Artificial Intelligence in Metaverse. |
| Intended Learning Outcomes <i>(Note 1)</i> | <p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> show a clear understanding of the fundamentals of digital twins, and the benefits of using digital twins. understand the various key enabling technologies of digital twins and the process of creating digital twins. demonstrate a clear understanding of the fundamentals of virtual human and the benefits. understand the enabling technologies to design and integrate virtual human characters into Metaverses. apply the technologies of digital twin and virtual human in potential industries such as manufacturing, automobile, and smart cities. |
| Subject Synopsis/ Indicative Syllabus <i>(Note 2)</i> | <ol style="list-style-type: none"> Introduction to digital twin and virtual humans, and their use cases and benefits Digital twin building blocks and technology enablers including modelling and simulation of physical assets, sensors, etc. Virtual human technology including speech recognition, natural language processing, dynamic feedback, emotional realism, etc. Design and development of digital twin and/or virtual human solutions for various applications such as smart cities, smart conferences, etc. |
| Teaching/Learning Methodology <i>(Note 3)</i> | The course is comprised of lectures, group project, and seminars. |

| | <p>During lectures, students are taught the important concepts, principles, and technologies that support digital twins and virtual humans.</p> <p>In the group project, small group discussions will be encouraged, and students will need to present their results and solutions in the form of reports and presentations.</p> <p>Students are also encouraged to give seminar talks about topics and case studies relevant to digital twins and virtual humans to reinforce their understanding of the knowledge taught and to explore further topics.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>Assessment Methods in Alignment with Intended Learning Outcomes</p> <p>(Note 4)</p> | <table><tr><th rowspan="2">Specific assessment methods/tasks</th><th rowspan="2">% Weighting</th><th colspan="6">Intended subject learning outcomes to be assessed</th></tr><tr><th>a</th><th>b</th><th>c</th><th>d</th><th>e</th><th></th></tr><tr><td>1. Assignments & Tests</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr><tr><td>2. Group Project</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr><tr><td>3. Examination</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr><tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr></table> <p><i>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</i></p> <p>Students will be assessed by their performance in three parts: 1) Assignments and Tests, 2) Group Project, and 3) Examination.</p> <ul style="list-style-type: none">▪ Assignments and tests aim to assesse students’ abilities to comprehend basic concepts and principles.▪ Group Project involves a group of students designing and implementing a solution for a practical digital twin and virtual human application. In the project, students will collaboratively work together to apply what they have learned in the class to solve practical problems.▪ The course will have a final exam. | Specific assessment methods/tasks | % Weighting | Intended subject learning outcomes to be assessed | | | | | | a | b | c | d | e | | 1. Assignments & Tests | 30% | ✓ | ✓ | ✓ | ✓ | ✓ | | 2. Group Project | 30% | ✓ | ✓ | ✓ | ✓ | ✓ | | 3. Examination | 40% | ✓ | ✓ | ✓ | ✓ | ✓ | | Total | 100 % | | | | | | |
| Specific assessment methods/tasks | % Weighting | | | Intended subject learning outcomes to be assessed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | a | b | c | d | e | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Assignments & Tests | 30% | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Group Project | 30% | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Examination | 40% | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 100 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Student Study Effort Expected</p> | <table><tr><td>Class contact:</td><td></td></tr><tr><td><ul style="list-style-type: none">▪ Class activities (lectures, seminars)</td><td>39 Hrs.</td></tr><tr><td>Other student study effort:</td><td></td></tr></table> | Class contact: | | <ul style="list-style-type: none">▪ Class activities (lectures, seminars) | 39 Hrs. | Other student study effort: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class contact: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Other student study effort: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| | ▪ Assignments, projects, exams, self-study. | 66 Hrs. |
| | Total student study effort | 105 Hrs. |
| Reading List and References | <p>Reference Books:</p> <ol style="list-style-type: none"> 1. “Digital Twin Technology” Gopal Chaudhary, Manju Khari, Mohamed Elhoseny, CRC Press, 2021 2. “Digital Twin Technologies and Smart Cities (Internet of Things)”, Maryam Farsi, Alireza Daneshkhah, Amin Hosseinian-Far, Hamid Jahankhani, Springer, 2020 3. “Building Industrial Digital Twins”, Shyam Varan Nath, Pieter van Schalkwyk, Dan Isaacs, Packt Publishing, 2021 4. “3-D Human Modelling and Animation, 3rd”, Peter Ratner, Wiley, 2009. 5. “3D Face Modelling, Analysis and Recognition”, Mohamed Daoudi, Anuj Srivastava, 2013. 6. ACM Transactions on Graphics 7. ACM SIGGRAPH 8. Computer Animation and Virtual Worlds. | |