Module designation	**Digital Learning Environment** **Indonesian title:** *Lingkungan Belajar Digital* **Course code:** 8420202236
Semester(s) in which the module is taught	Semester 7 (Fourth year)
Person responsible for the module	**Coordinator:** Dr. Yurizka Melia Sari, M.Pd. **Teaching staff:** Dr. Yurizka Melia Sari, M.Pd.
Language	Indonesian
Relation to curriculum	Elective
Teaching methods	Interactive lectures, case-based learning, project- based learning with design workshops, simulation-based learning, and group discussions **Media and tools:** Slides, LCD projector, UNESA Learning Management System (LMS), GeoGebra, Desmos, Polypad, students' devices (1-to-1), classroom monitoring and dashboard platform for simulations
Workload (incl. contact hours, self-study hours)	**(Estimated) total workload:** 2 CU × 170 minutes × 16 weeks = 5,440 minutes = 90.67 hours (≈ 3.18 ECTS) **Contact hours:** lectures, 2 × 50 minutes per week × 16 weeks = 26.67 hours (class hours per week: 340 minutes = 5.67 hours, including structured activities) **Private study including examination preparation:** structured assignments, 2 × 60 minutes per week × 16 weeks = 32.00 hours; independent study, 2 × 60 minutes per week × 16 weeks = 32.00 hours (total 64.00 hours)
Credit points	2 CU (3.18 ECTS) *1 CU = 170 minutes per week × 16 weeks = 45.3 hours; 1 ECTS = 28.48 hours (144 CU = 229 ECTS), so 1 CU = 1.59 ECTS (UNESA Rector's Decree No. 736/HK/KM/2023).*
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	**Programme learning outcomes (PLO) addressed:** • PLO-1: Able to demonstrate religious, national and cultural values, as well as academic ethics in carrying out their duties. • PLO-6: Demonstrate mathematical knowledge and insight. • PLO-8: Design, implement and evaluate mathematics learning using IT. • PLO-10: Make decisions based on data/information in completing tasks that are the student's responsibility and evaluating the work that has been done. **Course learning outcomes (CLO): after completing this module, students are able to:** • CLO-1: Articulate the characteristics, main components, functions, and interaction dynamics of Digital Learning Environments (DLE) that support meaningful mathematics learning at the junior and senior secondary levels (PLO 10) • CLO-2: Analyse and select features of digital tools (GeoGebra, Desmos, Polypad) that are relevant to the secondary mathematics curriculum, based on digital affordance (PLO

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CLO-3: Predict the development of students' cognitive schemes (instrumentation) and their adaptation of tools (instrumentalisation), including diagnosing technical and conceptual obstacles (instrumental distance) in the process of instrumental genesis (PLO 8)
CLO-4: Apply embodied design activities that use perception- action loops and attentional anchors in digital learning environments (PLO 10)
CLO-5: Design lessons that optimise learning trajectories in digital environments using instrumental orchestration theory (PLO 6)
CLO-6: Manage lessons in digital learning environments, make appropriate interventions, and facilitate students' learning (PLO 6)

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<tr><td>Content</td><td>This course is designed for final-year pre-service mathematics teachers to bridge advanced digital technology with mathematics pedagogy at the junior and senior secondary levels. Grounded in Digital Affordance, Instrumental Genesis, Instrumental Orchestration, and Digital Embodied Cognition, it prepares students to design, manage, and evaluate Digital Learning Environments (DLE). Students analyse and select features of tools such as GeoGebra, Desmos, and Polypad, diagnose the obstacles students meet when using digital tools, design embodied and interactive tasks, and plan didactical configurations, exploitation modes, and teacher interventions. They then practise managing lessons in a 1-to-1 device setting through simulations, including real-time monitoring, scaffolding, and facilitating plenary discussions based on students' digital work. The course contributes to SDGs 4 and 9.</td></tr>
<tr><td>Examination forms</td><td>Final score is calculated from the weekly assessment scheme below (CLO/PLO addressed and weight of each assessment):
<table>
<tr><th>Week</th><th>CLO</th><th>PLO</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO-1</td><td>PLO-6</td><td>5</td></tr>
<tr><td>2</td><td>CLO-2</td><td>PLO-6</td><td>5</td></tr>
<tr><td>3</td><td>CLO-2</td><td>PLO-6</td><td>5</td></tr>
<tr><td>4</td><td>CLO-3</td><td>PLO-10</td><td>5</td></tr>
<tr><td>5</td><td>CLO-3</td><td>PLO-10</td><td>5</td></tr>
<tr><td>6</td><td>CLO-4</td><td>PLO-6</td><td>5</td></tr>
<tr><td>7</td><td>CLO-5</td><td>PLO-8</td><td>5</td></tr>
<tr><td>8</td><td>CLO-5</td><td>PLO-8</td><td>5</td></tr>
<tr><td>9</td><td>CLO-5</td><td>PLO-8</td><td>5</td></tr>
<tr><td>10</td><td>CLO-5</td><td>PLO-8</td><td>5</td></tr>
<tr><td>11</td><td>CLO-5</td><td>PLO-8</td><td>5</td></tr>
<tr><td>12</td><td>CLO-5</td><td>PLO-8</td><td>5</td></tr>
<tr><td>13</td><td>CLO-6</td><td>PLO-8</td><td>10</td></tr>
<tr><td>14</td><td>CLO-6</td><td>PLO-8</td><td>10</td></tr>
<tr><td>15</td><td>CLO-6</td><td>PLO-8</td><td>10</td></tr>
<tr><td>16</td><td>CLO-6</td><td>PLO-8</td><td>10</td></tr>
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<tr><td>Study and examination requirements</td><td>Students are considered competent and pass if the final score, calculated from weekly assignments and project outputs (weeks 1 to 12: 60%), simulation-based practice (weeks 13 to 15: 30%), and the</td></tr>
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<td>final assessment (week 16: 10%), is at least 55 or C.
Final index (grade conversion):
<table>
<tr><th>Index</th><th>Converted score</th><th>Score range (A = final score)</th></tr>
<tr><td>A</td><td>4.00</td><td>85 ≤ A ≤ 100</td></tr>
<tr><td>A-</td><td>3.75</td><td>80 ≤ A < 85</td></tr>
<tr><td>B+</td><td>3.50</td><td>75 ≤ A < 80</td></tr>
<tr><td>B</td><td>3.00</td><td>70 ≤ A < 75</td></tr>
<tr><td>B-</td><td>2.75</td><td>65 ≤ A < 70</td></tr>
<tr><td>C+</td><td>2.50</td><td>60 ≤ A < 65</td></tr>
<tr><td>C</td><td>2.00</td><td>55 ≤ A < 60</td></tr>
<tr><td>D</td><td>1.00</td><td>40 ≤ A < 55</td></tr>
<tr><td>E</td><td>0.00</td><td>0 ≤ A < 40</td></tr>
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<td>Reading list</td>
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1. Oyovwe, S. O., & Oyovwi, M. O. (2026). Unveiling the latent curriculum incidental mathematics through digital task integration in secondary education. Discover Education, 5, 286. https://doi.org/10.1007/s44217-026-01123-7
2. Drijvers, P., Doorman, M., Boon, P., Reed, H., & Gravemeijer, K. (2010). The teacher and the tool: Instrumental orchestration in the technology-rich mathematics classroom. Educational Studies in Mathematics, 75(2), 213-234.
3. Wei, H., Bos, R., & Drijvers, P. (2025). A digital-embodied design for functional thinking in the classroom. Mathematical Thinking and Learning. https://doi.org/10.1080/10986065.2025.2493375
4. Haspekian, M. (2014). An instrumental approach to study the integration of digital resources into mathematics teachers' practices. ZDM Mathematics Education, 46(1), 23-37.
5. Clark-Wilson, A., Robutti, O., & Sinclair, N. (Eds.). (2014). The mathematics teacher in the digital era: An international perspective on technology integration in mathematics classrooms. Springer.

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