# Lecture

<table>
<tr><td>Module designation</td><td colspan="3">CE739 Mobile Pervasive Computing</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="3">5</td></tr>
<tr><td>Person responsible for the module</td><td colspan="3">Dareen Kusuma Halim</td></tr>
<tr><td>Language</td><td colspan="3">English & Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td colspan="3">Compulsory</td></tr>
<tr><td>Teaching methods</td><td colspan="3">Lecture</td></tr>
<tr><td>Workload (incl. contact hours, self-study hours)</td><td colspan="3">Total workload: 90.72 hours<br>- 23.34 hours of synchronous lecture & demonstration.<br>- 56.04 hours of self-study and assignments in the form of mini projects.<br>- 11.34 hours related to exam and self study</td></tr>
<tr><td>Credit points</td><td colspan="3">2 SKS (3.36 ECTS)</td></tr>
<tr><td>Required and recommended prerequisites for joining the module</td><td colspan="3">Required:<br>- CE449 Computer Network<br>- IF330 Web Programming<br>Recommended:<br>- IF351 Database System</td></tr>
<tr><td rowspan="3">Module objectives/intended learning outcomes</td><td rowspan="2">Course Learning outcome</td><td colspan="2">Related ELOs</td></tr>
<tr><td>ELO</td><td>Performance Indicator</td></tr>
<tr><td>Students are able to analyze the concept of distributed system, communication methods, transaction, protocols, synchronization, and replication.<br>Students are able to analyze the elements of mobile pervasive systems, particularly those that incorporate hardware, software, and internet (Internet of Things).</td><td>I</td><td>Understand the concept of software and hardware integration, distributed system, and computer communication protocols.</td></tr>
<tr><td>Content</td><td colspan="3">This course teaches the concept of distributed system and mobile pervasive computing; its architectural models, protocols, security, remote invocation, synchronization, replication, transaction, quality of service; as well as its applications.<br>Specifically, this course contain these topics:<br>1. Introduction to Distributed System<br>2. Internet of Things in Industry</td></tr>
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| | 3. Infrastructure Support for Mobility<br>4. Web Technologies<br>5. Failure Detection<br>6. Time Synchronization<br>7. Multicast Communication<br>8. RPC/RMI<br>9. Leader Election<br>10. Mutual Exclusion<br>11. Consensus<br>12. Concurrency Control, 2-Phase Commit & Paxos Algorithm<br>13. Replication Control<br>14. Gossiping |
| Examination forms | Written test |
| Study and examination requirements | Total score ≥ 55 must be satisfied.<br>The total score is the weighted average of the assignments (30%), the midterm exam (30%), and the final exam (40%). |
| Reading list | 1. George Coulouris, Jean Dollimore, Tim Kindberg, 2011, Distributed Systems: Concepts and Design, 5th Edition<br>2. Andrew S. Tanenbaum, 2023, Distributed Systems, 4th edition<br>3. Michael J. Fischer, Nancy A. Lynch, and Michael S. Paterson. "Impossibility of Distributed Consensus with One Faulty Process". Journal of the Association for Computing Machinery, Vol. 32 No.2, April 1985. pp. 374-382 |

# Lab

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| Module designation | CE739L Mobile Pervasive Computing Lab |
| Semester(s) in which the module is taught | 5 |
| Person responsible for the module | Dareen Kusuma Halim |
| Language | English & Indonesian |
| Relation to curriculum | Compulsory |
| Teaching methods | Demonstration, Cooperative learning |
| Workload (incl. contact hours, self-study hours) | Total workload: 45.36 hours<br>- 23.35 hours of group project (in-class assistance)<br>- 16.34 hours of self-conducted group project and assignments related to the group project<br>- 5.67 hours related to exam and self study |
| Credit points | 1 SKS (1.68 ECTS) |

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<tr><td>Required and recommended prerequisites for joining the module</td><td colspan="3">Required:<br>- CE449 Computer Network<br>- IF330 Web Programming<br>Recommended:<br>- IF351 Database System</td></tr>
<tr><td rowspan="3">Module objectives/intended learning outcomes</td><td rowspan="2">Course Learning outcome</td><td colspan="2">Related ELOs</td></tr>
<tr><td>ELO</td><td>Performance Indicator</td></tr>
<tr><td>Students are able to develop mobile pervasive systems, particularly those that incorporate hardware, software, and internet (Internet of Things).</td><td>D, I</td><td>Ability to operate and coordinate (if necessary) on technical working tasks in a team.<br><br>Ability to develop and integrate software and hardware as scalable distributed systems that incorporate various device types for the purpose of solving engineering problems.</td></tr>
<tr><td>Students are able to integrate various methods for devising inter-process and inter-object communication in a distributed system</td><td>F, I</td><td>Ability to construct solutions with logical, critical, and systematic thinking based on analytically-identified problems.<br><br>Ability to develop and integrate software and hardware as scalable distributed systems that incorporate various device types for the purpose of solving engineering problems.</td></tr>
<tr><td>Content</td><td colspan="3">This course covers the basics for developing Internet of Things (IoT) systems. Assigned to groups, students are required to design and implement an IoT system that incorporates at least two devices that are connected via cloud. While not compulsory, it is expected that the implementation applies distributed system theories and uses industrial-level tech stack.<br>Specifically, this course contains these topics:<br>1. IoT System General Architecture<br>2. RESTful Architecture & HTTP API<br>3. IoT Solution & Problem Solving</td></tr>
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| | 4. Server-side Development (Backend)<br>5. Server-side Development (Database)<br>6. Client-side Development (Frontend)<br>7. Server-Client Integration<br>8. Authentication & Authorization<br>9. GraphQL<br>10. Communication Protocol for IoT Devices<br>11. Devops – Web Server<br>12. Devops – Cloud<br>13. Devops – Secure system |
| Examination forms | Project, Observation |
| Study and examination requirements | Total score ≥ 55 must be satisfied.<br>The total score is the weighted average of the assignments (30%), the midterm exam (30%), and the final exam (40%). |
| Reading list | 1. Perry Lea, 2020, IoT and Edge Computing for Architects, 2nd Edition.<br>2. George Coulouris, Jean Dollimore, Tim Kindberg, 2011, Distributed Systems: Concepts and Design, 5th Edition.<br>3. Official documentations from various technologies used, e.g., React, MongoDB, MySQL, NodeJS, Docker, MQTT, etc. |