Syllabus Reference

Course title	Enhanced Operating Systems
Number of credit(s)	2
School sites	Ishikawa
Course group	Information Science courses (Ishikawa)
Course Number	I440
Language used in class	Japanese
Course Term	Term 2-2

Instructor
Full name
* Kiyofumi Tanaka

Day/Period	Term 2-2 (Wed・1) ／Term 2-2 (Fri・2)
Course goals	Students are able to learn the ability and attitude to conduct research distributed/embedded systems by gaining deeper knowledge of concepts, theory, techniques, and implementation methods of distributed/embedded operating systems.
Course content	Students study processes and threads in distributed systems, communication architecture, parallel/distributed scheduling, consistency models, security, real-time embedded systems, real-time scheduling, resource access protocols, real-time kernel, and embedded OS.
Textbook	Materials are provided every time
References	1. A.S.Tanenbaum, "Distributed Operating Systems," Prentice-Hall, 1995. 2. Giorgio C.Buttazzo, "Hard Real-Time Computing Systems - Predictable Scheduling Algorithms and Applications," 4th edition, Springer, 2023.
Related courses	I233 Operating Systems
Prerequisites	Students who attend this lecture need to have the knowledge of I233 Operating Systems.
Schedule	1. Parallel/Distributed Processes (Processes, threads, multithreads) 2. Communication Architecture (Message passing, shared address space, data parrallel, dataflow, systolic) 3. Parallel/Distributed Scheduling (Coscheduling, resource affinity, centralized/hierarchical/heuristic) 4. Consistency Models 1 (Strict/Sequential/Causal/PRAM/Weak/Release/Entry consistency) 5. Consistency Models 2 (Software distributed shared memory) 6. Security (Cryptography, user authentication, attacks, protection mechanisms) 7. Real-time Systems (Real-time tasks, real-time constraints) 8. Real-time Scheduling 1 (Aperiodic task scheduling) 9. Real-time Scheduling 2 (Periodic task scheduling) 10. Real-time Scheduling 3 (Fixed-priority servers) 11. Real-time Scheduling 4 (Dynamic-priority servers) 12. Resource Access Protocols (Semaphore, priority inversion, priority inheritance/ceiling protocol) 13. Real-time Kernel (Task states, data structure, kernel primitives) 14. Review and Exercise
How to prepare for this course Be well prepared for the course, taking it into consideration that one credit is awarded for 45 study hours	It is important to check and understand the definitions and meanings of the keywords in the next lecture. Be well prepared for the courses, taking it into consideration that one credit is awarded for every 45 hours including self-study time in addition to that of in total 15-hour lectures.

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Viewpoint of evaluation	Comprehension of techniques of operating systems in distributed/embedded systems.
Evaluation method	Reports and examination.
Evaluation criteria	Reports (40%), examination (60%)
Abilities/traits that can be acquired	・Social competencies: broad interests, logical thinking ・Creative abilities: ambition for expertise and skills, ideation ・Practical abilities: information gathering, exploratory propulsion, problem definition
Lecture Archive	What to record：Lectures only How to broadcast：General (available to watch over internal network anytime)

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