강 의 계 획 서

Course Syllabus

학년도/학기	2026 / Fall-semester	**학수번호-분반**	COM3041-01
이수구분	전공심화 (Advanced)	**성명**	KIM, HYEJI (김혜지)
교과목명	**AI Convergence Capstone Project** (인공지능융합캡스톤프로젝트 · 영어강의)		
수강대상학과	No restriction — open to students from all departments (제한 없음)		
선이수과목(권장)	Introduction to AI (recommended). Basic programming helpful but not required — a no-code / low-code build path is provided for students without a programming background.		

구분	제목 (Title)	저자 (Author)	발행년도	출판사
교재	The construction of shared knowledge in collaborative problem solving (in CSCL)	Roschelle, J., & Teasley, S. D.	1995	Springer
	Affective Computing	Picard, R. W.	1997	MIT Press
	The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems	VanLehn, K.	2011	Educational Psychologist
	Promises and challenges of generative AI for human learning	Yan, L., Greiff, S., Teuber, Z., & Gašević, D.	2024	Nature Human Behaviour
	Student engagement assessment using multimodal deep learning	Yan, L., Wu, X., & Wang, Y.	2025	PLOS ONE
	AI agents in computer-supported collaborative learning: A systematic literature review	Ba, S., Shi, X., Wu, S., & Lu, G.	2026	Computers and Education: AI
강좌관련자료	Selected papers on human-centered AI in education & Human-AI Interaction (ACM CHI, CHI EA, AI in Education) provided as PDF. Per-track key references are listed below. Starter code, workflow templates, and rubrics shared via GitHub.			
강좌진행방법	PBL / Blended (hybrid on–offline) · English-medium (Korean as secondary). Weekly cycle of short concept lectures + team studio critiques + hands-on prototyping with real learners/teachers, culminating in a conference-quality deliverable. In-studio research mentoring and peer review replace company mentoring.			

교과목 목표 · Course Objectives

This capstone reframes AI in education around what most ed-tech overlooks — the **affective and relational side of learning**. Interdisciplinary teams design, build, and evaluate a human-centered AI system that helps people learn — by sensing non-verbal cues, designing a better learning service, or mediating collaboration and conflict — and validate it with real learners or teachers.

Education is the shared application domain, not the destination: the methods practised here — **non-verbal cue sensing, human-AI interaction design, and user evaluation** — transfer directly to any AI system that interacts with people, from healthcare and workplace collaboration to games and robotics.

1. Primary objective — Students independently define a real educational problem, autonomously investigate AI-driven solutions, and design, implement, and present a final interactive system, gaining first-hand experience of human-centered

AI research methods.

2. Specific learning outcomes

- **Problem definition in education —** Observe real learning contexts and frame genuine learner/teacher needs (HCI double-diamond).
- **Reading the learner (non-verbal cues) —** Turn facial affect, gaze, posture, gesture, and movement style (Laban/Effort) into data, and interpret what they reveal about engagement, understanding, and hesitation.
- **Augmented-educator / HAI design —** Apply Human-AI Interaction principles — Socratic AI, epistemic humility — so AI supports rather than replaces teachers and peers.
- **Rapid prototyping for all backgrounds —** Integrate no-code/low-code automation and AI APIs with modern ML tooling so students from every background can contribute.
- **Human-experience evaluation —** Run a small learner/teacher study, use interpretation-first metrics (learning experience, trust, engagement) beyond accuracy, and communicate results as a conference-quality extended abstract.

Course goal (final deliverable): Each team produces a submittable extended abstract targeting **HCI KOREA 2027** (submission mid–late November 2026, aligned with Weeks 12–13). Standout teams are supported toward an **ACM CHI 2027 Late-Breaking Work** submission over the winter break. Grading rewards a complete, submittable deliverable — acceptance is a bonus, not a requirement.

프로젝트 트랙 · Project Tracks (choose one)

Track	Focus	Example projects
Track 1 · Non-verbal Cue Sensing (공학적 접근)	Sense learners' non-verbal cues — facial affect, gaze, posture, gesture, movement style (Laban/Effort) — and what they reveal about engagement, understanding & hesitation	Posture/gaze-based engagement & attention sensing · movement-style (Laban/Effort) cues of hesitation or confidence · emotion-aware feedback for online classes · gesture-based signals for teachers *→ Transfers to: driver attention & fatigue sensing, remote-meeting engagement, rehabilitation movement coaching*
Track 2 · Service & Experience (서비스·경험)	Design the learning service around human-AI collaboration	Socratic tutor with epistemic humility · metacognition / self-reflection support · augmented-educator copilot · accessible content authoring *→ Transfers to: customer-support copilots, employee onboarding, health self-management coaching*
Track 3 · Collaboration & Mediation (갈등 중재·협력)	Support group learning, dialogue and conflict mediation	AI mediator for team-project disagreements · constructive-debate & argumentation support · empathy-building peer feedback *→ Transfers to: team-collaboration tools, online community moderation, customer–agent de-escalation*

트랙별 핵심 참고문헌 · Key References by Track

Track	Foundational (근본)	Recent trends (최신 동향)
Track 1	Picard, R. W. (1997). Affective Computing. MIT Press.	Yan, L., Wu, X., & Wang, Y. (2025). Student engagement assessment using multimodal deep learning. PLOS ONE, 20(6), e0325377.
Track 2	VanLehn, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring	Yan, L., Greiff, S., Teuber, Z., & Gašević, D. (2024). Promises and challenges of generative AI for human learning. Nature Human

	systems. Educational Psychologist, 46(4), 197–221.	Behaviour, 8(10), 1839–1850.
Track 3	Roschelle, J., & Teasley, S. D. (1995). The construction of shared knowledge in collaborative problem solving. In C. O'Malley (Ed.), CSCL (pp. 69–97). Springer.	Ba, S., Shi, X., Wu, S., & Lu, G. (2026). AI agents in computer-supported collaborative learning: A systematic literature review. Computers and Education: Artificial Intelligence, 10, 100579.

수업 내용 · Weekly Plan (16 weeks)

주차	강의내용 (Session content)	수업 핵심질문 (핵심 개념)
1	Introduction & framing: human-centered AI for education — the affective/relational side of learning, augmented educators (not replaced). Course goal (HCI KOREA 2027 / CHI LBW). The three tracks introduced. Team building.	Why does the human side of learning matter? Teams & tracks formed (Discord/GitHub).
2	Problem discovery in education — observing real learning contexts; interviews with learners/teachers; HCI double-diamond.	Where do current AI/ed-tech tools fail people? (Presentation & discussion)
3	Reading the learner — non-verbal cues as data: facial affect, gaze, posture, gesture, and movement style (Laban/Effort); what they reveal about engagement & understanding. (pose & affect basics) [Reading: Picard 1997]	How do we make learners' non-verbal signals machine-readable?
4	Human-AI Interaction for learning — Socratic AI, epistemic humility, augmented educators, 'why fluent AI fails learners.' [Reading: VanLehn 2011; Roschelle & Teasley 1995] · Three-track jigsaw: groups read and present each track's recent reference, so track choice in Week 5 is informed.	What makes an educational AI trustworthy? Which track fits our team?
5	Team topic & track finalization; scoping — feasibility, data/users/MVP. Accessible build paths (no-code/low-code + AI APIs); rapid prototyping with APIs/agents. From here, each team sources its own readings.	Scoping a one-semester, submittable project. (Topic & track confirmed)
6	R&E proposal presentations & discussion — problem, learners/teachers, approach.	Proposal critique & feedback. (Presentation & discussion)
7	Prototyping methods — Wizard-of-Oz; connecting pretrained models / LLMs; joining perception to interaction. Baseline prototype. Ethics of classroom data introduced.	From concept to a working baseline.
8	Interim team presentation — mid-project build check & demo.	Is the core learning interaction working? (Midterm milestone)
9	Multimodal & embodied learning interaction — combining vision/motion/language; learning agents' non-verbal expression; Vision-Language-Action (VLA) perspective. Finalize user-study design.	How do modalities combine into one learning experience?
10	Affective computing & emotion-aware feedback in learning — giving feedback that helps rather than harms; interpreting emotion signals responsibly. Run user study.	Can a system respond to how a learner feels — well?
11	Collaboration, dialogue & conflict mediation in group learning — how AI agents facilitate, argue, and mediate; relational/service design around classroom human-AI collaboration. Analyze study results.	How should AI intervene between learners — and when should it not?

주차	강의내용 (Session content)	수업 핵심질문 (핵심 개념)
12	Writing the extended abstract — CHI / HCI KOREA format, structuring the contribution, figures; peer review of drafts.	Turning results into a conference-quality argument.
13	HCI KOREA 2027 extended-abstract submission. Responsible AI & governance for educational data woven into final design.	★ Submission milestone. (Team deliverable submitted)
14	Revision from submission feedback; using generative AI in learning responsibly; demo polishing.	Refining the prototype and the story.
15	Hackathon-based capstone final presentation & demo day — poster + live demo.	Final evaluation. (R&E showcase / poster)
16	기말고사 — Final report submission & assessment of core concepts. (CHI 2027 LBW teams continue toward the Jan deadline.)	Final exam / final report.

** Schedule subject to change.*

과제물 · Assignment

Team capstone in one education track (Non-verbal Cue Sensing / Service / Mediation): a working human-centered AI prototype + a conference-quality extended abstract (targeting HCI KOREA 2027) + a final demo/poster and report.

평가 · Assessment

출석 Att.	과제/토론 Assign./Disc.	중간시험 Midterm	기말시험 Final	평소학습 Partic.	발표 Present.	기타 Other	합계 Total
10%	20%	0%	20%	10%	30%	10%	**100%**

평가방법 · Assessment Method

Students are evaluated primarily on their team capstone rather than a written exam, in keeping with the course's project-based goal. **Presentations (30%)** cover the proposal, interim milestone, and final demo/poster; **assignments & discussion (20%)** and **ongoing participation (10%)** track weekly studio work; **Other (10%)** credits a complete, submittable extended abstract; the **final (20%)** combines the final report with an assessment of core concepts; **attendance (10%)**. Conference acceptance is recognized as bonus credit, never a requirement.

** Where students' practical backgrounds differ, hands-on work may use generative-AI and no-code platforms alongside coded implementations, so students from every background can contribute. Studies involving learners follow institutional research-ethics (IRB) guidance.*