附件16

大同大學遠距教學課程申請表暨教學計畫大綱

114.6.6 教務會議修訂通過

開課期間			114 學年度 □上學期 ☑下學期 □暑修
本學期是否為新開遠距教學課程：☑是 □否			是否申請教育部數位課程認證：□是 ☑否
壹、課程基本資料 （有包含者請於□打∨）			
課程名稱	中文：AI 實務專題	授課教師	宋建龍
	英文：**AI Practice Topic**	教師職稱	兼任教授
師資來源	☑專業系所聘任 □通識中心聘任 □以上合聘 □其他		
開課單位名稱（或所屬學院及科系所名稱）	工程學院資工系	選課別	□ 必修 選修 □ 其他
全英語教學	☑是 □否	學分數	3
教學型態（可複選）	□非同步遠距教學 同步遠距教學主播學校 填列本門課程之收播學校與系所或校區（若無校外收播學校則無須填寫）： (1)學校:_____(2)系所_____		
課程學制	☑學士班 ☑碩士班 □碩士班在職專班 □博士班		
國外學校合作遠距課程(有合作學校請填寫)	國外合作學校與系所名稱:_____ □國內主播 □國內收播 □境外專班 □雙聯學制 □其他		
開課班級數	1	預計總修課人數	20
課程線上平台網址（非同步教學必填）	https://ilearn.ttu.edu.tw/	同步線上課程系統	☑Teams □Google Meet □其他：_____
教學計畫大綱檔案連結網址	https://selquery.ttu.edu.tw/		
貳、課程教學計畫			

一、教學目標	Students will gain both the **foundational knowledge** and the **hands-on skills** needed to design and implement embedded AI systems using the NVIDIA Jetson platform. Through lectures, labs, and a semester-long capstone project, they will: • Understand the principles and challenges of embedded systems design, including performance, resource constraints, and reliability. • Gain practical experience with computer vision, deep learning, sensor integration, cloud connectivity, and user interface design. • Apply modern practices in testing, validation, power optimization, and security for embedded devices. • Collaborate in teams to define, design, build, and present a complete embedded AI system. By the end of the semester, students will have produced a **portfolio-ready project** that demonstrates their ability to solve **real-world problems in robotics, IoT, and AI at the edge** — skills that are highly sought after in industry and research.
二、適合修習對象	This course is designed for **upper-division undergraduate students and master's students** in **Computer Engineering, Electrical Engineering, Computer Science, or related fields** who: • Have prior experience with programming (Python or C++). • Possess background knowledge in computer architecture and basic AI or computer vision. • Are motivated to move from theory into **practical system design and prototyping**. Particularly relevant for those preparing for **careers or research in embedded systems, robotics, IoT, or edge AI** — fields driving growth in **autonomous vehicles, industrial automation, healthcare technology, and smart devices**. Participants will leave the course with **industry-relevant experience** and a **capstone project** they can showcase to employers or graduate programs.

三、課程內容大綱及授課進度表　　（註：遠距教學時數應超過總授課時數之二分之一）

週次	授課內容 （Subject/Topics）	教學活動說明	授課方式 (請對應方式填寫時數)			備註
			面授時數	遠距教學時數		放假、考試週停課、畢業班停課、或補課
			實體教學	非同步	同步	

1	Course Introduction; Embedded Systems Basics; Jetson Setup	**Lab:** Connect LED(s) to Jetson GPIO using a breakout kit. Program different blinking patterns (e.g., synced with music beat or CPU load). **Hardware:** Breadboard + GPIO breakout kit (40-pin ribbon cable + T-adapter) + jumper wires + 2–3 LEDs + resistors. **Other:** Team brainstorming; no homework.		on-demand	3	
2	Linux Systems and Sensor Interfaces	**Lab:** Connect an IMU sensor to Jetson; write code to read its values (e.g., acceleration, rotation). **Hardware:** IMU sensor (MPU6050) + breadboard (reuse kit). **Project:** Teams of 2 formed (3 with approval). **Homework 1:** Write a program to read sensor data and log results. **Due: by 11:59pm the day before Week 4 lecture.**		on-demand	3	
3	Computer Vision Fundamentals	**Lab:** Connect a webcam to Jetson; capture video; apply simple image filters (blur, edge detection, color change). **Hardware:** USB webcam (UVC compliant, Logitech C270 recommended). **Other:** No homework.		on-demand	3	
4	Deep Learning and Model Optimization	**Lab:** Run a pre-trained image classification model on Jetson; compare how fast it runs using different settings (full precision, half precision, quantized). **Hardware:** Jetson GPU only. **Homework 2:** Write code that runs a pre-trained model and compares speed under two settings. **Due: by 11:59pm the day before Week 6 lecture.**		on-demand	3	

5	Communication Protocols and Cloud Connectivity	**Lab:** Connect Jetson to a cloud server using MQTT or REST; send live sensor or camera data and view it remotely. **Hardware:** School-provided network/server; reuse USB webcam. **Other:** No homework.		on-demand	3	
6	Edge AI Applications: Real-Time Object Detection	**Lab:** Run a ready-made object detection model on Jetson. Use the webcam to detect everyday objects (e.g., person, bottle, chair) in real time. **Hardware:** USB webcam. **Homework 3:** Run the detection model with two settings (full precision and half precision). Compare how fast it runs. **Due: by 11:59pm the day before Week 8 lecture.**		on-demand	3	
7	Advanced Vision Systems	**Lab:** Use Jetson to detect movement in a camera feed. If available, test with two webcams to compare single vs multi-camera setups. **Hardware:** 1–2 USB webcams. **Other:** No homework.		on-demand	3	
8	Testing and Validation	**Lab:** Work with a buggy vision program. Find and fix errors, then write a small test to check if it works correctly. **Hardware:** USB webcam. **Homework 4:** Write a short program that automatically checks whether your detection or tracking code works. **Due: by 11:59pm the day before Week 10 lecture.**		on-demand	3	

9	Sensor Fusion and Data Processing	**Lab:** Combine webcam video and IMU sensor readings to track movement more accurately. **Hardware:** USB webcam + IMU sensor. **Project:** Submit **detailed written proposal (5–8 pages)**. Must go beyond labs/homework. **Extra credit (+10%)** for original feasible ideas. **Other:** No homework.		on-demand	3	
10	User Interfaces and Dashboards	**Lab:** Build a simple dashboard (desktop, phone, or web) that shows Jetson's live data (e.g., camera feed + sensor values). **Hardware:** Laptop/phone + network (school-provided). **Homework 5:** Dashboard with ≥2 live streams. **Must include unit test code + test results. Due: by 11:59pm the day before Week 12 lecture.**		on-demand	3	
11	Power Management and Deployment	**Lab:** Measure how much power Jetson uses when running different workloads. Try a few simple optimizations and compare results. **Hardware:** Jetson onboard monitors (optional USB power meter provided by school). **Other:** No homework.		on-demand	3	
12	Security and Privacy in Embedded Systems	**Lab:** Encrypt sensor data before sending it to the cloud. Simulate an attacker trying to read the unencrypted data. **Hardware:** None beyond Jetson + IMU + network. **Homework 6:** Write code that encrypts and decrypts a live data stream. **Must include unit test code + test results. Due: by 11:59pm the day before Week 14 lecture.**		on-demand	3	

13	Project Debugging and Integration Workshop	**Lab:** Guided debugging session for team projects. Instructor and TA provide hands-on support for integration issues. **Hardware:** Project-specific. **Other:** No homework.		on-demand	3	
14	Manufacturing and Scaling	**Lab: Project milestone check-in** — each team presents current progress and challenges. Receive instructor/peer feedback. **Hardware:** Project-specific. **Homework 7:** Write automated tests for one module of your project. Must include unit test code + test results. **Due: by 11:59pm the day before Week 15 lecture.**		on-demand	3	
15	Advanced Topics and Industry Applications	**Lab:** Teams work on final integration and practice presentations. **Hardware:** Project-specific. **Other:** No homework.		on-demand	3	
16	Final Project Presentations and Reflection	**Lab:** Each team presents and demonstrates their final project (10–12 minutes). Class discussion on lessons learned and connections to real-world applications. **Hardware:** Project-specific. **Other:** No homework; optional 1-page personal reflection.		on-demand	3	

彈性教學週活動規劃

週次	實施期間	實施方式	教學活動說明	彈性教學評量方式	面授時數	非同步時數	同步時數	備註
17,18	期末考後兩週	專題改善問答	期末專題改善	採加分方式	0	0	6	
各類時數合計（16 週+彈性教學週）								

四、教學方式 （可複選） 時數應與上表一致	☑1.提供線上課程主要及補充教材 ☑2.有線上教師或線上助教 ☐3.提供實體面授教學，次數：_____次，總時數：_____小時(A) ☑4.提供線上同步教學，次數：18 次，總時數：54 小時(B) ☐5.提供線上非同步教學，次數：____次，總時數：____小時 ☐6.其它，請說明：_____

每週面授及同步教學平均時數	____3_____小時，即(A +B)／總課程週數
五、數位學習平台運用方式(可複選)	呈現內容是否包含以下角色及功能（有包含者請打☑，可複選）: 1.提供給系統管理者進行學習管理系統資料庫管理 ☐1.個人資料 ☑2.課程資訊 ☐3.其他相關資料管理功能 2.提供教師(助教)、學生必要之功能 ☑1.課程資訊發佈及瀏覽 ☑2.教材內容觀看或下載 ☑3.成績管理及查詢 ☑4.線上測驗發佈 ☑5.學習資訊瀏覽 ☑6.互動式學習設計(聊天室或討論區) ☐7.各種教學活動之功能呈現 ☐8.其他相關運用，請說明：_____
六、師生互動討論方式(可複選)	☑1.教師線上辦公室時間：待訂_____ ☐2.教師辦公室時間：_____ ☐3.教師 E-mail 信箱：_____，校內分機：_____ ☑4.課程助教姓名：待訂_____，通訊方式：_____ ☐5.其他：_____
七、作業繳交方式(可複選)	☑1.線上說明作業內容 ☐2.線上即時作業填答 ☑3.線上討論區 ☑4.作業檔案上傳及下載 ☐5.線上測驗 ☐6.成績查詢 ☐7.其他做法，請說明：_____
八、成績評量方式	☐平時成績： 0 % ☑期中考： 20 % ☐線上互動： 0 % ☑出席率： 20 % ☑作業： 30 % ☑期末考：30 % ☐網路教學平台使用率： % ☐其他(_____)： %

九、上課注意事項	**Class Format**
	
	• The class meets synchronously once per week for 3 hours (80 minutes lecture + 100 minutes lab).
	• Lectures will be recorded and posted online for later review.
	• Lecture notes will also be provided for students to review asynchronously whenever needed.
	• Lab instructions and sample code will be provided online each week.
	
	Attendance and Labs (20% of final grade)
	
	• Each class session includes both lecture and lab activities.
	• Attendance and active participation in labs are **required** and count together as 20% of the grade.
	• Students must complete each week's lab to earn credit.
	• If an absence is necessary, valid proof must be submitted. The lab must still be completed independently for credit.
	• **Exception:** If a **critical technical issue** occurs during class (e.g., Jetson hardware failure, network outage, system crash), students may submit the lab late without penalty once resolved.
	• **Grading Policy:**
	  o **Full Credit (100%)** → Attended class and completed lab on time with working code and documentation.
	  o **Partial Credit (50%)** → Absent without valid proof, or lab incomplete/late without a valid reason.
	  o **No Credit (0%)** → No attendance and no lab submission.
	• External hardware is minimal and reused across the semester (breadboard + breakout kit, LEDs, IMU, webcam).
	
	Homework (30% of final grade)
	
	• Homework is **team-based, coding-only**, and due **by 11:59pm the day before the lecture in the assigned week**.
	• No starter code will be provided.
	• **AI tools (e.g., ChatGPT, GitHub Copilot)** are **highly encouraged**, but all submissions must:
	  o Be clearly documented (purpose, parameters, return values, usage examples).
	  o Follow **object-oriented design principles** when using Python or C++ (e.g., encapsulation, reusable classes, modular design).
	• **Grading Policy:**
	  o Points will be **deducted** if instructions are not followed, even if the code runs correctly.

- If two or more teams submit nearly identical code, **points will be divided among them**. In short: **don't cheat**.
- **Additional Requirement (starting with Homework 5):**
  - Each submission must include **unit test code**.
  - A **test results log or screenshot** showing successful execution of the unit tests must also be provided.

Midterm Project Proposal (20% of final grade, + up to 10% extra credit)

- Teams submit a **detailed written project proposal (5–8 pages)** in Week 9.
- Must include: introduction, background, system design, hardware/software requirements, implementation plan, testing plan, risks, and expected outcomes.
- **Project Directions:**
  - The instructor will provide a list of **suggested project directions** that are designed to be feasible within the semester and with the available hardware kit.
  - Teams may choose one of these suggested directions, or propose their own original idea.
  - If proposing an original idea, the team must **justify feasibility** in terms of time (7 weeks), scope (2-person team), and hardware (minimal cost beyond the provided kit).
- **Scope Rules:**
  - Projects must be feasible within 7 weeks for a 2-person team.
  - Hardware must be limited to the provided kit (breadboard, breakout kit, LEDs, IMU, webcam), with only minor low-cost additions if absolutely necessary.
  - Projects cannot simply repeat a lab or homework. They may **build on them**, but must add new functionality, integration, or a real-world use case.
  - Overly ambitious or expensive projects will not be approved.
- **Extra Credit:**
  - Proposing and carrying out a well-justified **original project idea** (rather than selecting from the suggested directions) may earn the team up to **+10% extra credit** toward the midterm grade.
- Counts as the **midterm exam**. No presentation required.

Final Project Deliverable and Presentation (30% of final grade)

- In **Week 16**, each team gives a **15-minute presentation and live demo** of their final project.
- Deliverables include:
  - Complete, well-documented code with unit tests.
  - A short technical report (8–12 pages).

	• Projects are graded on functionality, creativity, documentation, teamwork, and adherence to scope. • Counts as the **final exam**. **Teamwork** • Teams of 2 are required (3 only with instructor approval). • All members are expected to contribute equally. • Teams are encouraged to use collaboration tools (e.g., GitHub, Slack/Discord, Google Docs). **Professional Conduct** • Academic integrity is required. Collaboration is allowed only within teams; code sharing across teams is prohibited. • Students must maintain respectful and professional communication in all online settings. **Instructor Availability** • In addition to regular office hours, students are welcome to **contact the instructor as needed** for questions, guidance, or troubleshooting. • Communication should be respectful and professional. Responses will typically be given within a reasonable timeframe.
十、智慧財產權注意事項	(一)請填寫附件 2「遠距教學課程著作權切結書」並隨本教學計畫提報。 (二)注意事項： 1. 相關教材(含文字、圖片或影音檔)務請遵守智慧財產權並於合理範圍內引用。(請參著作權法第 44~65 條已訂定相關合理使用的情形) 2. 若有屬於他人(或書商)著作財產權部份，請另檢附權利人之授權同意書，並依法標示作品來源。 3. 善用創用 CC 授權素材(http://creativecommons.tw)，授權條款包括應「姓名標示」、「非商業性」、「禁止改作」以及「相同方式分享」四個授權要素。