1. **Course Number and Course Title:**
   MLR 511 - Mobile Application Development with Machine Learning

2. **Credits Hours:**
   3–0–3

3. **Prerequisites and/or Co-Requisites:**
   Prerequisite: Approval of the CSE Head of Department
   Concurrent: None
   Competencies: Programming skills and undergraduate-level knowledge of object-oriented programming

4. **Name and Contact Information of Instructor:**
   Dr. Tamer Shanableh
   Office: ESB-2046
   Email: tshanableh@aus.edu
   Phone: (06)515-2506
   Office Hours: Posted on office door and iLearn; also by appointment

5. **Course Description (Catalog Description):**
   - Covers advanced mobile application development including widgets, screen navigations and view models; asynchronous tasks and databases; downloading and parsing data asynchronously; analyzing images on mobile devices with general-purpose machine learning models; building customized machine learning models for on-device processing.

6. **Textbook and other Supplemental Material:**

Textbook:

- S. Alessandria, B. Kayfitz: *Flutter Cookbook - Second Edition: 100+ real-world recipes to build cross-platform applications with Flutter 3.x powered by Dart 3 (alpha)*, 2023, Packt Publishing Limited

Supplementary material:

- Laurence Moroney, *AI and Machine Learning for On-Device Development: A Programmer's Guide,* 2021, O'Reilly Media
- Selected research papers

7. **Course learning Outcomes:**
   Upon completion of the course, students will be able to:
   1. Develop apps using widgets, screen navigations and view models
   2. Build scrollable lists of data using recycle views
   3. Create database apps using background processes
   4. Demonstrate model compression for on-edge deployment.
   5. Analyze images using on-device general-purpose machine learning models
   6. Build customized machine learning models for mobile apps using TensorFlow Lite
   7. Review current research work in machine learning related to mobile app development

8. **Teaching and Learning Methodologies:**

Methods include lectures; problem and project based learning methods (simulations, and research paper) and class discussions.

9. Course Topics and Schedule:

Topic	Weeks
Dart programming	Week 1
GUI interfaces and widget trees	Week 2
GUI interactivity and navigation	Week 3
Data lists and recycle views	Week 4
ML Model compression using pruning, quantization and projection	Week 5
Creating smaller ML models using knowledge distillation	Week 6
Using the device's camera	Week 7
Firebase Machine learning Kit for mobile apps	Week 8
Detecting faces and their gestures, recognizing text in images, in mobile apps	Week 9
TensorFlow lite for mobile apps	Week 10
Creating custom machine learning models for mobile apps	Week 11
State management and view-model separation	Week 12
Using Firebase, configuration, login and dependencies	Week 13
Creating, reading and writing to databases	Week 14
Review, evaluation and class presentations/demos	Week 15
Final exam	Week 16

10. Schedule of Laboratory and other Non-Lecture Sessions:

This course has no labs.
The survey paper is done individually and is due in week 13. Students are asked to conduct a review on a specific topic related to edge machine learning on mobile devices then write a short paper to summarize their findings. They are also asked to present their findings to the class.
The research project is conducted individually as well and is due at the last week of the semester. Students are asked to search existing literature for machine learning applications related to image processing or computer vision and implement them using mobile apps with machine learning and TensorFlow Lite. The students are asked to submit a report detailing the algorithm they implemented alongside their code. They are also asked to demo their projects to the class.

11. Out-of-Class Assignments with Due Dates:

Assignment	Due Date (tentative)
Short tutorials	Weeks 3 to 10
Survey paper and presentation	Week 12-13, Wednesday, 12,19/Nov
Research project and demo	Week 13-14, Wednesday, 19,26/Nov

12. Student Evaluation:

Assessment	Weight	
Midterm exam	20%	Week 8, 15/October
Quizzes	10%	Weeks 3,6 and 10
Short tutorials	5%	Cf. Section 11
Survey paper and presentation	10%	Cf. Section 11
Research project and demo	20%	Cf. Section 11
Final Exam	35%	Week 16, 10/December

13. Assessment Instruments:

Assessment	Course Learning Outcomes
Short tutorials	O4
Survey paper and presentation	O7
Research project	O5-O6
Midterm exam	O1-O3
Final Exam	O1-O6

14. Contribution of Course to Student Outcomes

This course contributes to the accomplishment of the following program outcomes:

Students Outcome	Emphasis in this course	Course Learning Outcomes
1. Perform research emphasizing creativity, independent learning and scientific methods in a chosen area of computer engineering	◑	O7
2. Apply advanced mathematics and engineering knowledge in identifying, formulating and solving engineering problems	◑	O5,O6
3. Select and use techniques, skills and modern tools necessary for research or professional practice	●	O1-O6
4. Communicate effectively	◑	O7
5. Recognize the need for and engage in life-long learning		
6. Attend to professional and ethical responsibilities		

Emphasis: ● High; ◑ Medium; ○ Low; Blank – Nothing Specific Expected

15. Letter Grade Policy:

Total (T)	Letter Grade
$95 \leq T$	A
$90 \leq T < 95$	A-
$85 \leq T < 90$	B+
$80 \leq T < 85$	B
$75 \leq T < 80$	B-
$70 \leq T < 75$	C+
$60 \leq T < 70$	C
$T < 60$	F

16. Course Rules and Regulations

i) You need a laptop with at least 12~16GB RAM. You will need to install and setup Android Studio, Flutter Dart. You will use that for the midterm, course project and assignments. The complete and correct installation is YOUR RESPONSIBILITY. Without proper RAM and proper installation, you will not be able to do that midterm and final. The installation link is: https://docs.flutter.dev/get-started/install

ii) I am away for a conference from 19 to 22 of October/2025. If I am not back on time for the class on the 22/Oct then we will have a make-up class on **16/Nov/2025 (Week 13) at 11 am.**

iii) According to the 24-25 AUS calendar, Sunday, the 26/Oct, Week 10 is a class day.

iv) Academic Honesty:

The university's academic integrity policy will be strictly enforced. All forms of academic dishonesty including but not limited to cheating/ fabrication/ plagiarism/ multiple submission/ aiding or abetting / illegal system access are prohibited and will be severely penalized. Please refer to the university rules related to academic integrity outlined in the student handbook (Student Academic Integrity Code). Students involved in any form of academic dishonesty will be reported to the Dean's office.

v) Attendance:

- Absence for more than 15% of classes will automatically lead to a forced withdrawal from the class, in which case the student will receive a grade WF on the transcript.
- Attendance will be taken at the beginning of each class. Three late incidents will be counted as one absence.

vi) Grade curving:

There will be no curving up for the grades.

vii) Generative AI tools:

The use of generative AI tools, including ChatGPT and other similar tools, to complete or support the completion of any form of exams, assignments or project in this course is not allowed and would be considered academic misconduct.