1. **Course number and Course Title**
   COE 487 – Virtual and Augmented Realities

2. **Credits Hours**
   3-0-3

3. **Prerequisites and/or co-requisites**
   Prerequisites: COE 312 or CMP 256

4. **Name and Contact Information of Instructor**
   Dr. Hicham H. Hallal

5. **Course Description**
   Focuses on hardware and software aspects of virtual reality (VR) and augmented reality (AR) systems. Addresses the integration of AR and VR technologies in the development of computer games and other engineering applications. Covers 3D modeling, inertial measurement units (IMUs) and sensors, scene management, user interactivity, performance evaluation, single and multiplayer games, use of patterns in game development.

6. **Textbook and other supplemental materials**
   Textbook:
   - Steve Lavalle, Virtual Reality, Cambridge University Press, 2019

   Supplemental materials:
   - Jesse Schell, The Art of Game Design, Morgan Kauffman, 2008
   - Jason Jerald, The VR Book: Human-Centered Design for Virtual Reality, ACM Books, 2015.
   - Jonathan Linowes, Unity Virtual Reality Projects: Explore the world of virtual reality by building immersive and fun VR projects using Unity 3D, 2015.
   - Handouts and Lecture notes through iLearn.

7. **Course Learning Outcomes:**
   Upon completing the course, students will be able to:
   1. Demonstrate an understanding of the main concepts and technologies involved in developing AR and VR systems.
   2. Analyze the hardware and software requirements for developing VR and AR systems.
   3. Build AR and VR based applications using known development environments.
   4. Apply the game development process by implementing a computer game.
   5. Develop computer games in the VR domain.
   6. Integrate relevant design patterns in the development lifecycle of AR/VR applications and computer games.

8. **Teaching and Learning Methodologies**
   Methods include lectures and class discussions, practical demonstrations, invited talks, homework assignments, and a project.

9. Course Topics and Schedule:

Topic	Weeks
Introduction: Immersive environments: AR , VR, and Computer games	1
VR and AR hardware	2
3D graphics for VR and AR	2
User interactivity in VR and AR systems	2
IMUs and sensors	2
Introduction to Unity 3D	2
Game design and development	2
Multiplayer game development	1
Advanced topics in game development	1
Total	15