

UNIVERSITY OF SOUTHERN CALIFORNIA  
School of Engineering  
Department of Electrical and Computer Engineering

E.S. Kim

EE 599, Fall 2021

**Wearable Technology**

4 Units -- M 4:00 - 4:50pm KAP 167 & ONLINE  
W 9:00 – 11:50am KDC 241 & ONLINE

**Instructor:** Prof. Eun Sok Kim  
PHE 602, 740-4697, eskim@usc.edu

**Office Hours:** MW 3:00 - 3:50

**Textbook:** Lecture notes from <http://blackboard.usc.edu/>  
"Wearable Sensors," © 2014 Elsevier – Free download available.

**References:** "Fundamentals of Microelectromechanical Systems," © 2021 McGraw Hill  
"Wearable and Implantable Medical Devices," © 2020 Elsevier  
"Wearable Technology in Medicine and Health Care," © 2018 Elsevier  
"Wearable Electronic Sensors for Safe and Healthy Living," © 2015 Springer  
"Measurement, Instrumentation, and Sensors Handbook," © 1999 CRC Press

**Helpful (Not Mandatory) Prerequisite:** EE348 and EE370L

**Course Description and Objectives:**

This course teaches fundamentals of wearable technology with focus on the following topics:

- (1) sensing, signal processing (analog and digital), RF communication,
- (2) power sources, power management, energy harvesting,
- (3) flexible substrate technology, and
- (4) wearable algorithms.

**Tentative Course Contents:**

<b>Week</b>	<b>Topic</b>	<b>Reading Assignment in Addition to Lecture Notes</b>
1	Introduction to Wearable Technology	Ch. 1.1 of Wearable Sensors
2 – 4	Wearable Sensors for Acceleration, Angular Velocity, Ambient Pressure, Audio, Magnetic Field, Infrared Imaging, Vapors, Lab on Skin, etc.	Ch. 2.2 of Wearable Sensors, pp. 107 – 133 of Wearable Electronics Sensors, Ch. 1 of Wearable and Implantable Medical Devices
5 - 6	Sensing Technologies, Flexible/Stretchable Substrate Technology, RF Communication	Ch. 6.4 of Wearable Sensors
7	Batteries, Energy Harvesting, and Power Management for Wearable Technology	Ch. 4.1 of Wearable Sensors
8 - 9	Wearable Algorithms, Feature Extraction, Training and Classification, etc.	Ch. 5.1 of Wearable Sensors, Chs. 5 and 6 of Wearable Monitoring Systems
10 - 11	Digital Signal Processing, Difference Equation, Convolution, Z Transform, DFT, FFT, Signal Modulation, etc.	Chs. 81 – 83 of The Measurement, Instrumentation, and Sensors Handbook
12 - 13	Wearable Technology for Healthcare: Heart Rate Sensing, Blood Oxygen Sensing, Electrocardiogram, etc.	Ch. 2.3 of Wearable Sensors, Chs. 11 and 12 of Wearable Technology in Medicine and Health Care

**Grading:** Homework: 20%, Term Paper and Oral Presentation: 40%, and Final Exam: 40%.