

ESE529 List of Potential Projects with Goals

Below is a list of 7 potential final design projects for ESE529. Each project has a minimum set of specifications, provided below, that should be met. You may find additional specifications are needed. You are welcome to propose a different device with specifications and submit this proposal to the Professor for concurrence. Deadlines for the project timeline are provided below. There is a template for the report (a 4-page conference paper format) and an example located in the Projects directory on Canvas. There are also several key papers for each topic area below uploaded to Canvas in the Readings folder.

Projects Introduced	3/26
Deadline for Submitting Device Projects and Specifications to the Professor if not Pursuing One of the Devices Listed Below	4/2
Deadline for Informing the Professor of Your Team, Device, and Specifications	4/2
Final 4-Page Paper Describing Device Design, Predicted Performance, and Fabrication Process Due	4/30

Please use the link below to enter your project team into the spreadsheet

https://docs.google.com/spreadsheets/d/1soYag0xQyoD9A1yhkd3TlSV0kXjtGOoB/edit?usp=drive_link&ouid=110918236987890520807&rtpof=true&sd=true

MEMS Gyroscope: Design the structure (geometry with dimensions), actuators (drive and sense), and fabrication process to realize a MEMS gyroscope targeting the parameter below:

Sense Current at 1 °/sec (nA)	Bandwidth (Hz)
> 0.1	> 50

MEMS Neural Probe: Design the structure (geometry with dimensions), electrodes, and fabrication process to realize a MEMS neural electrode with a single penetrating shank meeting the specifications below:

Site Impedance (MΩ)	Maximum Site Diameter (μm ²)	# of Sites	Maximum Shank Width (μm)
< 1	< 20	≥ 8	< 30

RF-MEMS Switch: Design the structure (geometry with dimensions), actuator, and fabrication process to realize a metal contacting RF MEMS switch with the target specifications below:

Actuation Voltage (V)	Contact Force (μN)	Restoring Force (μN)	Switching Speed (kHz)
< 100	> 300	> 300	> 10

RF-MEMS Resonator for Filters: Design the structure (geometry with dimensions), actuation, and fabrication process to realize a MEMS resonator targeting RF filtering applications with the specifications below:

Frequency (GHz)	Motional Impedance (Ω)	K^2 (%)	Q
$0.7 \leq f \leq 5.5$	< 1	> 5	> 1000

RF-MEMS Resonator for Oscillator: Design the structure (geometry with dimensions), actuation, and fabrication process to realize a MEMS resonator targeting oscillator applications with the specifications below:

Frequency (MHz)	Motional Impedance (Ω)	Q	Maximum Power Handling (μW)
$10 \leq f \leq 30$	$< 10,000$	$> 10,000$	> 10

RF-MEMS Resonator for Timer: Design the structure (geometry with dimensions), actuation, and fabrication process to realize a MEMS resonator targeting timing applications with the specifications below:

Frequency (kHz)	Motional Impedance ($k\Omega$)	Q	Temperature Stability over 0-45 °C
32.768	< 100	$> 10,000$	± 50 ppm

Microphone: Design the structure (geometry with dimensions), sensing, and fabrication process to realize a MEMS microphone with the specifications below:

Sensitivity	Frequency Range (kHz)
≥ 0.5 mV/Pa	At least 0.1 to 5