## Faculty of Engineering & Technology

### Microsystems Technology

**Information :**

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| **Course Code :** | ELE 524 | **Level** | : Undergraduate | **Course Hours :** | 3.00- Hours |

**Department :** Specialization of Electronics & Communication

**Area Of Study :**

Ántroduce advanced semiconductor devices
ÁDevelop a detailed understanding of the fabrication technology of semiconductor
electronic, optoelectronic devices and microelectromechanical devices.
Ántroducing the design parameters, performance parameters and CAD models, etc.

**Description :**

Physical principles, Design, and micro fabrication technologies pertinent to input (sensor) and
output (actuator) devices for multimedia applications such as document and video imaging
devices, Micro mirror projection displays and micro-electro-mechanical systems.

**Course outcomes :**

**a.Knowledge and Understanding: :**

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| 1 - | Describe the basic operation of advanced semiconductor, optical devices and MEMS and their characteristics. |
| 2 - | Define design features that determine the device characteristics. |
| 3 - | Define the device models for circuit simulation. |

**b.Intellectual Skills: :**

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| 1 - | Develop analytical models for the advanced semiconductor, optical devices and MEMS. |
| 2 - | Use device models for circuit simulation |
| 3 - | Use semiconductor, optical devices and MEMS for material and process characterization. |
| 4 - | Examine a detailed understanding of the many and diverse aspects that relate to the operation and exploitation of semiconductor devices. |

**c.Professional and Practical Skills: :**

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| 1 - | - Develop a practical circuit simulation using compact device models |
| 2 - | Develop technical report writing skills |
| 3 - | Design, model and analyze a number of semiconductor advanced semiconductor, optical devices and MEMS types. |

**d.General and Transferable Skills: :**

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| 1 - | d1- Communicate effectively. |
| 2 - | d2- Demonstrate Efficient IT capabilities using modern software tools |

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## Course Topic And Contents :

| Topic | No. of hours | Lecture | Tutorial / Practical |
|---|---|---|---|
| Introduction to Microsystems, Microfabrication | 5 | 3 | 2 |
| Microfabrication . Cleaning, Oxidation, Doping, bonding | 5 | 3 | 2 |
| Microfabrication . lithography, Process development | 5 | 3 | 2 |
| Review basic mechanical concepts, pressure sensor | 5 | 3 | 2 |
| Piezoresistance, Piezoelectricity | 5 | 3 | 2 |
| Radiation sensing . theory, Optical sensors . photodiodes | 10 | 6 | 4 |
| Optical . CCDs, LED, LCD | 15 | 9 | 6 |
| High energy radiation detectors, Biochemical sensing, Hall effect | 10 | 6 | 4 |
| GMR read/write heads | 5 | 3 | 2 |
| Noise . characteristics of random noise, sources and analysis | 10 | 6 | 4 |

## Teaching And Learning Methodologies :

Interactive Lecturing

Problem Solving

Discussion

Experiential Learning

## Course Assessment :

| Methods of assessment | Relative weight % | Week No | Assess What |
|---|---|---|---|
| Assignments | 5.00 | | |
| Final Exam | 40.00 | | |
| Lab and Project | 15.00 | | |
| Mid Term I | 15.00 | | |
| Mid Term II | 15.00 | | |
| Quizzes | 10.00 | | |

## Course Notes :

Taken by the student inside classroom

## Recommended books :

- Microsystem Design, Stephen Senturia, Springer, 2001.
- Device Electronics for Integrated Circuits. 3rd Ed, R. Muller R. Kamins and M.
Chan, Wiley, 2002.
- Foundation of MEMS, Chang Liu, 2nd Ed., Prentice Hall, 2011.

## Periodicals :

- IEEE periodicals, Nanohub.org

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