

**UNIT V: Microprocessor Applications in Automotive Engineering:**

Lighting and Security Systems: Vehicles lighting Circuits, Signaling Circuits, Central locking and electric windows security systems, Airbags and seat belt tensioners, Miscellaneous safety and comfort systems.

**TEXT BOOK:**

1. TOM DENTON, "Automobile Electrical and Electronic Systems", Edward Arnold publications, 1995.

**REFERENCES:**

1. DON KNOWLES, "Automotive Electronic and Computer controlled Ignition Systems", Prentice Hall, 1988.
2. WILLIAM, T.M., "Automotive Mechanics", McGraw Hill Book Co.,
3. WILLIAM, T.M., "Automotive Electronic Systems", Heiemann Ltd., London ,1978.
4. Ronald K Jurgen, "Automotive Electronics Handbook", McGraw Hill, Inc, 1999.

<b>IV Year I Semester</b>	<b>L T P To C</b>
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<b>MT 433 MICRO ELECTRO MECHANICAL SYSTEMS (ELECTIVE - III)</b>	

**Course Description & Objectives:**

*Micro-Electro Mechanical Systems (MEMS) are integration of mechanical elements and electronics on a common silicon wafer using micro fabrication techniques. This course serves as an introduction to basic processes used in fabricating MEMS devices and designing MEMS sensors and actuators.*

**Course Outcomes:**

*On completion of this course, students would be able to:*

1. *familiarize with Micro-Electro Mechanical System (MSME)*
2. *acquire knowledge of patterning technology as well as micro machining technology*
3. *concentrate on future trends and applications of MSME*

**UNIT I: MEMS Overview:**

Definition, history and development, examples, dimensional analysis and scaling, complex 3D micro structure, technology considerations, material requirements, measured signal and performance.

**UNIT II: Patterning Technology:**

Lithographic patterning, mask design, selective wet etching, Directional dry etching, tin film deposition.

**UNIT III: Micro Machining Technology:**

New materials from MEMS, Surface and bulk micro machining, Release of microstructures. **Packaging and Integration:** Wafer bonding, chemical & mechanical polishing, packing sensors and circuit integration.

**UNIT IV: Future Trends:**

Mechanical, Optical Transducers. **Biomedical & Chemical Transducers:** Optical MEMS, bio MEMS, Plastic MEMS.

**UNIT V: Applications:**

Telecommunication equipment, computer printers, Actuators, Consumer products such as Cameras, Camcorder, Timers, Clock, Wipers, Fax machines, Recorders.

**TEXT BOOKS:**

1. M.Gad-el-Hak, "The MEMS Hand book", CRC Press, 2002.
2. N. Maluf, "An Introduction to Micro electro mechanical systems engineering", Artech House, Boston, 2000.

**REFERENCES:**

1. B.Bhushan, "Handbook of Micro / Nano Tribology", CRC Press, 1999.
2. M.J.Madou, "Fundamentals of Micro machining", CRC Press, 1997.

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## MT435 OPERATIONS RESEARCH (ELECTIVE - III)

**Course Description & Objectives:**

*To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.*

**Course Outcomes:**

*Upon completion of this course, the students would be able to:*

1. *use the optimization techniques in engineering and business problems*
2. *use different models in solving critical industrial problems*

**UNIT I: Linear Models:**

The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.