

ME 677 Laser Material Processing

Course Instructor : **Prof. Ramesh Singh/Prof. Deepak Marla**
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: By appointment

Course Objectives:

- Introducing the practical applications of lasers
- Develop insight into the physical phenomenon of laser-matter interaction
- Develop first order mathematical descriptions for select laser processes
- Understand the capabilities and limitations of various laser processes

Scheme of assessment

Assignments (5)	15%
Quizzes (3)	10%
Midterm	25%
Project	20%
End semester examination	30 %

Total	100 %

Please note:

1. Lecture notes and home works will be posted on the course website
2. Home-works will be submitted individually and are **due in class on the day of submission. No late home-works accepted.**
3. Any form of uncanny similarity or copying on the homework **will be severely penalized.**
4. Students could opt for an **analysis project** either using Deform/commercial finite element code or analytical techniques. **Hands on projects** which involve experimental analysis will also be considered. Alternatively, a **research paper** on recent work in manufacturing could also be considered under certain conditions.
5. Quizzes will be an in-class test and can be surprise or scheduled.

Text Book:

William M. Steen, Laser Material Processing, 3rd Edition, Springer-Verlag, 2008

Elijah Kannatey-Asibu, Jr., Principles of Laser Materials Processing, Wiley, 2009

References:

George Chryssolouris, P. Sheng, Frederick F. Ling (Editors), Laser Machining: Theory and Practice, Springer-Verlag, New York, 1991

Cemil Hakan Gür, Jiansheng Pan, Handbook of Thermal Process Modeling Of Steels, CRC, 2008

Lihui Wang, Jeff Xi (Editors), Smart Devices and Machines for Advanced Manufacturing (Chapter: Laser-Assisted Mechanical Micromachining by Ramesh Singh and Shreyes N. Melkote), Springer-Verlag, 2008

Schedule of Lectures, Assignments and quizzes

Lecture No.	Date	Schedule of Assignments & quizzes	Lecture No.	Date	Schedule of Assignments & quizzes
1.	03.01.19 Thu	Laser Introduction I		Mid-term 22-28.02.19	
2.	07.01.19 Mon	Introduction II + Applications	16.	04.03.19 Mon	Laser Texturing (HW4)
3.	10.01.19 Thu	Laser Optics I	17.	07.03.19 Thu	Laser Bending I
4.	14.01.19 Mon	Laser Optics II (HW1)	18.	11.03.19 Mon	Laser Bending II
5.	17.01.19 Thu	Thermal Modeling	19.	14.03.19 Thu	Laser Bending III (HW5)
6.	21.01.19 Mon	Thermal Modeling	20.	18.03.19 Mon	Laser Micro-nano Processing I + II
7.	24.01.19 Thu	Thermal Modeling (HW2)	21.	25.03.19 Mon	Laser Micro-nano Processing III +IV(HW6)
8.	28.01.19 Mon	Conventional Processes I-Cutting	22.	28.03.19 Thu	Interferometry
9.	31.01.19 Thu	Conventional Processes I-Cutting	23.	01.04.19 Mon	Interferometry (HW7)
10.	04.02.19 Mon	Conventional Processes II – Laser welding	24.	04.04.19 Thu	Biomedical Applications + Laser Safety
11.	07.02.19 Thu	Conventional Processes II – Laser welding (HW3)	25.	08.04.19 Mon	Advanced Topics
12.	11.02.19 Mon	Review	26.	11.04.19 Thu	Advanced Topics
13.	14.02.19 Thu	Laser Surface Modification I + II	27.	15.04.19 Mon	Project Presentation
14.	18.02.19 Mon	Laser Surface Modification III + IV	28.	18.04.19 Thu	Project Presentation
15.	21.02.19 Thu	Laser Surface Cladding			