



Laser Lab.

**Course Book – (4th Year
Physics– Commination
Lecturer's Dr. Abidulla Uthman
Msc. Samira Yousif
Msc.Eman Abid Almajeed
Academic Year: 2021/2022**

Course Book(Lab)

1-Course Name	Laser (lab.)
2-Lab. Staff	Lecturer's Dr. Abidulla Uthman Msc. Samira Yousif <i>Msc.Eman Abid Almajeed</i>
3-Department/ College	E-mail: samira.asoka@su.edu.krd Website
4-Contact	Practical: 2
5-Time(In hours) per week	Sunday 9:30 – 11:30 am,
6-Office Hours	10 h / week
7- Course Code	n/a
8- Teacher's academic profile	
9- Keywords	N/A
10- Course Overview:	<p>This module introduces Laser physics and emphasizes its role in communication, especially fiber optic cable , by studying the characterization of several types of optical fiber. This course presents an overview of the fundamentals of the Laser system, starting with an overview of laser properties and fiber optics and moving to simple experiment components and their application: profile of laser beam, Photodetector characteristic, attenuation laser light in fiber optics, bending lose in fiber optics, and application of fiber optic in communication and medicine</p> <p>.</p>

make at least one seminar relevant to the nuclear laboratory experiments in which all the students will participate in the discussions and evaluations.

During this year the student must be report a patient which treated by laser in hospital and laser center.

14- Assessment scheme

All exams have 40 marks, full report has 5 marks(During this year the student must be report a patient which treated by laser in hospital and laser center .10%(every week each student prepared the report about the experiment , quizzes (5%)and 20% final exam
: 10%+5%+ 5%+20%==40%

15- Student Learning Outcome:

✓ By the end of the course, students will be expected to be able to...

Describe an laser system and physical principles, for each of the types of laser in medicine (co2, pulsed laser ... and application in medicine.

✓ Students who took the module of Laser In Medicine would easily be able to find a job in the Laser department in the Laser centers.

16- Course Reading list and References:

The main text books are:

1. Suzanne Amadorkane , introduction to physics in modern medicine
2. Orazio Svelto, David C. "Hanna,Principles of Lasers" Springer New York Dordrecht Heidelberg London, 2010.
3. Ronald W. Waynant" LASERS IN MEDICINE"United States of America,2002.
4. Markolf H. Niemz"biological and medical physics, biomedical engineering" University of Heidelberg,Springer ,2007

17- The Topics

Lecture's Name

Exp.1 : Spatial Profile of a Laser Beam

Dr.Amange Francis
MSc. Samera Yousif
(1 Week)

Exp.2 : Laser pulse Characterization

Dr.Amange Francis
MSc. Samera Yousif
(1 Week)

Exp.3 : Measuring Concentration of Liquids Using a Laser Pointer(part A and part b)(2 weeks)

Dr.Amange Francis
MSc. Samera Yousif
(2 Week)

Exp.4 : Polarization and Optical Activity

Dr.Amange Francis
MSc. Samera Yousif
(1 Week)

Exp.5 : CO₂ Laser

Dr.Amange Francis
MSc. Samera Yousif
(1 Week)

Exp.6 : measurement the *diameter of hair by laser diffraction*

Dr.Amange Francis
MSc. Samera Yousif

	(1 Week)
Exp.7 : Laser Doppler Velocimetry (LDV)	Dr.Amange Francis MSc. Samera Yousif (1 Week)
Exp.9 : Fraunhofer Diffraction from a circular aperture	Dr.Amange Francis MSc. Samera Yousif (1 Week)
Exp.10 : Photo detectors characteristics	Dr.Amange Francis MSc. Samera Yousif (1 Week)
Exp.11 : <i>Gaussian Nature of the Laser Beam & Evaluation of Beam Spot Size</i> TEM00 ,TEM02 and TEM11	Dr.Amange Francis MSc. Samera Yousif (1 Week)
Exp.12 : The Effect of Irradiation Distance on Micro hardness of Resin Composites Cured with Light-Emitting Diode	Dr.Amange Francis MSc. Samera Yousif (1 Week)
Exp.13 : Study of the Effect of Laser Focus on the Speed Penetration and Cutting	Dr.Amange Francis MSc. Samera Yousif (1 Week)
Exp.14 : <i>Measuring the Attenuation in Optical fiber</i>	Dr.Amange Francis MSc. Samera Yousif (1 Week)
Exp.1 5: Absorption coefficient for He-Ne laser	Dr.Amange Francis MSc. Samera Yousif (1 Week)

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Answer all the following questions . (24 Marks)

Q1) (3 Marks)

- a) How will the diffraction pattern changed when the diameter of the pinhole that produced a Fraunhofer Diffraction pattern is reduced? (1 mark)
- b) Find diameter of the pinhole at a known distance of screen from circular aperture of $D=500\text{mm}$. if you know the laser wave length (589 nm) use to diffraction pattern and the radius of the 1st dark ring equal to = 0.35 mm (2 marks)

Q2) (3 Marks)

- a) What is Brewster angle ? (1 mark)
- b) The polarization angle (Brewster angle) for Quartz by using laser diode is 59° , find the refractive index of

Quartz .

(2 marks)

Q3) (3 Marks)

- What is PRT of pulsed laser output?(Show it by a diagram only) .
- What is Duty cycle of pulsed laser?(Write the relation only).
- Define PRR.

Q4) (3 Marks)

Write the name of active medium of the CO₂ Laser and Write two application of CO₂ Laser in medicine?.

Q5) (3 Marks)

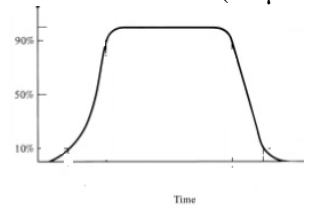
In optical resonator experiment, Find beam waist(ω_0) for He-Ne laser ($\lambda=632.8$ nm) at Z= 2 m distance and waist (ω_z) as function of propagation distance (z) = 0.5cm?.

Q6) (3 Marks)

Use the Doppler frequency to find the beam half over lab angle, that the particle velocity $V_t = 2.23$ cm/sec can be measured by determined the Doppler frequency equal 19052 Hz, if the wavelength of laser is 632.8nm.

Q7) (3 Marks)

- Calculate the Responsivity (R) in(A/W) of two photo-detector used for laser diode if you know in first photo-detector $I_{ph} = 6 \mu A$ and the second photo-detector $I_{ph} = 0.5 \mu A$? if you know the power of laser diode is (20 μW), which photo-detector is best for laser diode? (2marks)
- How can you find the Resptonse time of photo detector used for laser diode in this diagram and Write the equation ? (1 mark)



Q8) (3 Marks)

Calculate the absorption coefficient of glass using the fowing data

Draw the total internal reflection of Fiber optics

(1 mark)

- The data in this table (in Exp. Measuring the Attenuation in Optical Fiber Show (graphically) the attenuation as a function of incident angle . (2marks)

$\theta/degree$	$I/\mu A$
5	35
10	32
15	30
20	29
25	27

If you know $I_L = 20.8 \mu A$
 $I_F = 34 \mu$
 $L = 5$ m

20. Extra notes:

Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks.

21. Peer review

پیداچوونہوہی ھاوہل

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).

ئەم كۆرسىۋوكە دەبىت لەلایەن ھاوئەلىكى ئەكادىمىيە سەير بىكرىت و ناوئۆكى بابەتكانى كۆرسەكە پەسەند بىكات و جەند ووشەيك

بنووسنت لهسەر شیاوی ناوهرۆکی کۆرسهکه و واژووی لهسەر بکات.
هاوهل ئهه کسهیه که زانیاری ههیهیت لهسەر کۆرسهکه و دهیهیت پلهی زانستی له ماموستا کهمتر نهیهیت.