



DHANALAKSHMI SRINIVASAN INSTITUTE OF TECHNOLOGY

(Approved by AICTE, New Delhi & Affiliated to Anna University)

NH - 45, Trichy - Chennai Trunk Road,

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COURSE PLAN

Subject code: MD6008

Branch/Year/Sem/Section: B.E BME/VIII/IV

Subject Name: FIBER OPTICS AND LASERS IN MEDICINE

Batch: 2016-2020

Staff Name: B.MUTHAMIL

Academic year: 2019-2020

COURSE OBJECTIVE

1. To be familiar with objective property of tissues.
2. To be exposed to Optical Holography

TEXT BOOK:

T1. Leon Goldman, M.D., & R. James Rockwell, Jr., "Lasers in Medicine", Gordon and Breach, Science Publishers Inc., 1975.

T2. Abraham Katzir, "Lasers and Optical Fibers in Medicine", Academic Press Edition, 1998

REFERENCES:

R1. Tuan Vo Dirh, "Biomedical Photonics – Handbook", CRC Press, Boca Raton, 2003 (Unit I – III, V) R2.

R2 Glasser, O., "Medical Physics -- Vol 1, 2, 3" Adam Hilgar Bristol Inc, 1987

R3 G. David Baxter "Therapeutic Lasers – Theory and practice", Churchill Livingstone Publications Edition- 2001

WEB RESOURCES

W1: <https://www.aslms.org/for-the-public/specialty-laser-and-energy-based-device-use/otolaryngology> (TOPIC NO: 24)

W2: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4526611/> (TOPIC NO: 26)

TEACHING METHODOLOGIES:

- BB - BLACK BOARD
- VIDEO - VIDEO TUTORIAL
- PPT - POWER POINT PRESENTATION



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DEPARTMENT OF BIOMEDICAL ENGINEERING

MD6008

FIBER OPTICS AND LASERS IN MEDICINE

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UNIT I OPTICAL PROPERTIES OF THE TISSUES

9

Refraction, scattering, absorption, light transport inside the tissue, tissue properties, Light interaction With tissues, optothermal interaction, fluorescence, speckles.

UNIT II INSTRUMENTATION IN PHOTONICS

9

Instrumentation for absorption, scattering and emission measurements, excitation light sources – high Pressure arc lamp, solid state LEDs, optical filters, polarisers, and time resolved and phase resolved detectors.

UNIT III APPLICATIONS OF LASERS

9

Laser in tissue welding, lasers in dermatology, lasers in ophthalmology, otolaryngology, urology

UNIT IV OPTICAL HOLOGRAPHY

9

Wave fronts, interference patterns, principle of hologram, optical hologram, applications

UNIT V SPECIAL TECHNIQUES

9

Near field imaging of biological structures, in-vitro clinical diagnostic, fluorescent spectroscopy, Photodynamic therapy.

TOTAL: 45 PERIODS

Topic No	Topic Name	Books For reference	Page No	Teaching Methodology	No of periods required	Cumulative periods
UNIT I OPTICAL PROPERTIES OF THE TISSUES						(9)
1.	Refraction	T1	2	BB	1	1
2.	Scattering	T1	3	BB	1	2
3.	Absorption	T1	5	BB	1	3
4.	Light transport inside the tissue	T1	7	BB & VIDEO	1	4
5.	Tissue properties	T1	8	BB	1	5
6.	Light interaction With tissues	T1	10	BB	1	6

7.	Optothermal interaction	T1	25-31	BB	1	7
8.	Fluorescence	T1	69-83	BB	1	8
9.	Speckles	T1	-	BB	1	9

LEARNING OUTCOME:

At the end of unit , the students will be able to

- Know the fundamentals of light transportation.
- Understand the concept of tissues intraction.
- Understand the properties of tissues.

UNIT II INSTRUMENTATION IN PHOTONICS (9)

10.	Instrumentation for absorption	T1	25-31	BB	1	10
11.	Scattering measurements	T1	33-37	BB	1	11
12.	Emission measurements	T1	38-40	BB	1	12
13.	Excitation light sources	T1	41-48	BB	1	13
14.	High Pressure arc lamp	T1	55-59	BB	1	14
15.	Solid state led s	T1	69-83	BB	1	15
16.	Optical filters	T1	315-317	BB & VIDEO	1	16
17.	Polarisers	T1	322-327	BB	1	17
18.	Time resolved and phase resolved detectors	T1	333-337	BB	1	18

LEARNING OUTCOME:

At the end of unit , the students will be able to

- Understand the concept of scattering and emission measurements.
- Define excitation light sources.
- Gain the knowledge about detectors

UNIT - III STORAGE MANAGEMENT (9)

19.	Laser in tissue welding	T1	472	BB & VIDEO	1	19
20.	Lasers in dermatology	T1	229-236	BB & VIDEO	1	20
21.	Lasers in dermatology	T1	229-236	BB	1	21

22.	Lasers in ophthalmology	T1	135-161	BB & VIDEO	1	22
23.	Types of Lasers in ophthalmology	T1	135-161	BB	1	23
24.	Lasers in otolaryngology	T1	175-198	BB & VIDEO	1	24
25.	Types of Lasers in otolaryngology	T1	175-198	BB	1	25
26.	Lasers in urology.	T1	211	BB & VIDEO	1	26
27.	Types of Lasers in urology.	T1	255-269	BB	1	27

LEARNING OUTCOME:

At the end of unit , the students will be able to

- Understand the concept Laser in medicine.
- Gain knowledge about Lasers in otolaryngology, ophthalmology.
- Define Lasers in dermatology.

UNIT IV OPTICAL HOLOGRAPHY (9)

28.	Wave fronts	R2	225	BB	1	28
29.	Types of Wave fronts	R2	227	BB	1	29
30.	Interference patterns	R2	6	BB	1	30
31.	Significance of Interference patterns	R2	6	BB	1	31
32.	Principle of hologram	R2	2-3	BB&PPT	1	32
33.	Hologram and holography	R3	2-5	BB	1	33
34.	Optical hologram	T1	2-9	BB & VIDEO	1	34
35.	Significance of Optical hologram	T1	5-11	BB	1	35
36.	Applications of optical holography	T1	12-21	BB	1	36

LEARNING OUTCOME:

At the end of unit , the students will be able to

- Understand the concept of optical holography.
- Known about Wave fronts and Interference patterns.
- Get the knowledge about Applications of optical holography

UNIT V SPECIAL TECHNIQUES (9)

37.	Near field imaging of biological structures Principles	-		BB	1	37
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38.	Application of Near field imaging of biological structures	-		BB	1	38
39.	In-vitro clinical diagnostic Scheduling	T1	792-799	BB	1	39
40.	In-vitro clinical diagnostic techniques	T1	800-808	BB	1	40
41.	Fluorescent spectroscopy	T2	28.9	BB	1	41
42.	Types of fluorescent spectroscopy	T2	28.6	BB	1	42
43.	Photodynamic therapy	T1	220	BB & VIDEO	1	43
44.	Examples photodynamic therapy	T1	225	BB	1	44
45.	Application of photodynamic therapy	T1	225	BB & VIDEO	1	45

LEARNING OUTCOME:

At the end of unit , the students will be able to Apply lasers in different areas of medicine

COURSE OUTCOME

At the end of the course, the student should be able to:

- Apply lasers in different areas of medicine.
- Explain the special techniques of Lasers.
- Use the Photonics instrumentation.

CONTENT BEYOND THE SYLLABUS

LASERS AND FIBRE OPTICS

CONTINUES INTERNAL ASSESSMENT DETAILS

ASSESSMENT NUMBER	I	II	MODEL
TOPIC NO.(UNIT)	1-18 (1 st & 2 nd units)	19-36 (3 rd & 4 th units)	1-45 (units 1-5)

ASSIGNMENT DETAILS

ASSIGNMENT NUMBER	I	II	III
TOPIC NUMBER FOR REFERENCE	1-18 (1 st & 2 nd units)	19-36 (3 rd & 4 th units)	1-45 (units 1-5)
DEAD LINE			

ASSIGNMENT NUMBER	BATCH	DESCRIPTIVE QUESTIONS/TOPIC (Minimum of 8 Pages)
I	B1	Light transport inside the tissue
	B2	High Pressure arc lamp
	B3	Fluorescence and Speckles
II	B1	Lasers in otolaryngology
	B2	Lasers in urology.
	B3	Applications of optical holography
III	B1	Fluorescent spectroscopy
	B2	Lasers in ophthalmology
	B3	Optothermal interaction