

*Department of Basic science*

**A- Basic information**

<b>1-Subject title</b>	<b>Medical Physics</b>	
<b>2-Number of credits</b>	Theory:4	Laboratory:2
<b>3-Number of contact hours</b>	Theory:2h/wk.	Laboratory:2h/wk.
<b>4-Subject time</b>	First Year	

Number	Title of the lectures	Hours
1	<b>Terminology</b> Terms: Medical Physics, physical medicine, Physical therapy, Health	2
2	Physics, Radiological Physics, clinical physics. Modeling, Accuracy, Precision, False Positive, False Negative.	2
3	<b>Force on &amp; in body:</b>	2
4	Static forces :( type of levers with medical examples). Dynamic forces (Centrifuge)	2
5	<b>Physics of the skeleton:</b> Bones:(Function of bones, Composition of bone, bone remodeling, compact and trabecular bone)	2
6	Stress-strain curve :( compressive and tensile stress, young modulus). Bone joints :( Synovial fluid, coefficient of a joint).	2
7	<b>Heat and cold in medicine:</b> Physical basis of heat and temperature, Temperature scales, Converting Temperatures, Temperature in Dentistry, Thermal expansion, (Linear, Area, Volume Thermal Expansion), Thermometry, Heat therapy,	2
8	Thermography, Cold in medicine and cryosurgery. Thermal conductivity.	2
9	<b>Energy, work and power of the body:</b> First law of thermodynamic. Energy change in the body (Met, Basal metabolic rate (BMR).	2
10	Work and power. Efficiency heat losses from the body. Anaerobic phase and aerobic phase. Hypothalamus (body's thermostat).Heat lost by (radiation, convection, evaporation of sweat and respiration).	2
11	<b>Pressure:</b> Definition, absolute pressure, gauge pressure, negative pressure, unit of pressure. Measurement of pressure in the body	2
12	(Manometer).Pressure inside the skull. Eye pressure. Pressure in the skeleton. Pressure in the urinary bladder.Boyle's law: (pressure while diving).HOT (hyperbaric oxygen therapy).	2
13	<b>Electricity within the body:</b> Electrical potential of nerves (resting potential, action potential in myelinated and unmyelinated nerves) Electromyogram	2
14	(EMG). Electrical potential in the heart (electrocardiogram ECG). Electroencephalogram (EEG)	2
15	<b>Sound in medicine:</b> Properties of sound.	2
16	Stethoscope (including heart sound).mechanism of hearing	2
17	<b>Ultrasound</b> (A-scan, B-scan, M-scan and Doppler effect). Physiological	2
18	effect of ultrasound in therapy.	2
19	<b>Light in medicine:</b> Light nature, Planck Equation, (Reflection, Refraction and	2

20	Absorption of Light, Properties of light), Diffuse reflection, Specular reflection, Phototherapy, Application of ultraviolet and infrared light in medicine, Tanning and Skin Cancer.	2
21	<b>Laser in medicine.</b> What is laser? Application of laser in medicine	2
22	Atomic Transitions, Population inversion, Laser Typical Characteristics, General Applications of Laser, Laser Dental Applications, Reshape gum tissue, Laser aided teeth whitening, Laser Drill.	2
23	<b>Physics of eye and vision:</b> Focusing element of the eye (cornea, lens).	2
24	Element of the eye (pupil, aqueous humor, vitreous humor, sclera). Visual acuity, Snellen chart, optical density.	2
25	<b>Physics of diagnostic X-ray:</b> Properties of X-ray, production of X-ray. Absorption of X-ray, contrast	2
26	media-ray image (penumbra, grid, and intensifying screens). Radiation to patients from X-ray (filters).	2
27	<b>Physics of nuclear medicine:</b> Radioactivity decay, half-life, units. Basic instrumentation and its medical application (GM-tube, Photomultiplier tube, scintillation detector, solid state detector). Therapy with radioactivity. Radiation doses in nuclear medicine.	2
28		2
29	<b>Physics of radiation therapy:</b> The dose units (Rad and Gray). Principles of radiation therapy. Brach therapy, quality factor (QF).	2
30		2
<b>Total</b>		<b>60</b>

### **Laboratory sessions**

Lab number	Study unit title	Hours
1	Guidelines of Medical Physics Lab and Rules must be obeyed by the students	2
2	Graphing Techniques	2
3	Ohm's law:	2
4	- verify ohm's law - to find the value of different values of resistance	2
5	<b>Semiconductors (junction diode):</b> To determine the characteristics of the semiconductors	2
6	Comparison between omic and non-omic resistance	2
7	<b>Cathode Ray Oscilloscope</b> -Measurement of deflection sensitivity of D. C. voltage.	2
8	-Measurement of deflection sensitivity of A. C. voltage	2

9	<b>The focal length of convex lens:</b> -Rough value of focal length of different convex lenses,	2
10	-A graphical method of measuring of focal length, Comparison between these methods and the given value.	2
11	<b>Hook's law:</b> -To verify Hook's law and determine the force constant of the	2
12	spring. -To determine the work done by stretching the spring.	2
13	<b>Focal length of concave mirror:</b> -Locating the radius of curvature	2
14	-Determining the focal length	2
15	General review and 1 <sup>st</sup> course exam	
16	<b>Laser applications:</b> -To measure the width of a single slit by using a laser	2
17	-To measure the wavelength of laser by using a certain single slit	2
18	<b>Boyle's law:</b> -To verify Boyle's law	2
19	-To measure the pressure of the atmosphere	2
20	<b>Inverse Square law:</b> - To verify the inverse square law	2
21	- Radiation shielding by different thicknesses of of a certain material	2
22	<b>Viscosity of a liquid</b> - To determine the viscosity of a medium using a small sphere falls with a constant terminal velocity.	2
23	- To verify Stokes' law	2
24	<b>Velocity of the sound</b> - To measure the velocity of the sound by using a resonance tube, closed at one end, at room temperature.	2
25	- Calculated the theoretical and practical values of the velocity of sound and comparing between them.	2
26	<b>The focal length of a converging lens</b> - To determine the focal length of a converging lens by lens displacement method using conjugate foci.	2
27	- To calculate curvature value of this converging lens	2
28	<b>Simple Pendulum</b> -To determine the periodic time and its variation with the	2
29	length of the pendulum -To calculate the acceleration of free fall	2
30	General review and 2 <sup>nd</sup> course exam	2

Total

60