



University of Management and Technology

School of Science

Department of Physics

Course Code PH-106

Course Title: MEDICAL PHYSICS

Program: BS (BT/BC)

Schedule

Course Outline (Spring Semester 2021)

Course Coordinator	Hafiz Arslan Hashim	Contact	arslan.hashim@umt.edu.pk
Course Description	Electricity and DC Circuits, Conductors and Insulators, Electric Force (Coulomb's law) and Electric Field, Superposition of Electric Fields, Electric Potential, Potential Energy and Work, The Heat and ECG, The Capacitor, Energy Stored in a Capacitor, Capacitors in Series and Parallel, Ohm's Law, Electric circuits, Power Sources, Kirchoff's Laws, Electric Shock Hazards, Electricity in Cells, Charging and Discharging of RC Circuits, The Nature of Light, Reflection, Refraction, Dispersion, Geometric Optics, The Eye and Vision: Emmetropia, Myopia, Hypermetropia, Wave Optics: Interference, Diffraction, Visual Acuity, Atom and Atomic Physics, The Nuucleus and Nuclear Physics, Production of Ionising Radiation, Interactions of Ionising Radiation (X-rays, Gamma-rays), Biological Effects of Ionising Radiation , Medical Imaging, Magnetism and MRI. .		
Expected Outcomes	Much of the biological research during the past hundred years has been directed toward understanding living systems in terms of basic physical laws. This effort has yielded some significant successes. The purpose of this course is to relate some of the concepts in physics to living systems. Students will be prepared to undertake advance courses in Life Science and Medical Physics.		
Text Book	Introduction to Biological Physics for the Health and Life Sciences, Kirsten Franklin, Paul Muir, Terry Scott, Lara Wilcocks, and Paul Yates, John Wiley and Sons, UK, 2010.		
Ref. Book	Physics in Biology and Medicine, Paul Davidovits, 3 rd edition, Elsevier (Academic Press) 2008.		
Assignment & Projects	Problems will be assigned at regular intervals as an assignment.	Quizzes	All quizzes will be announced well before time. No make-ups will be offered for missed quizzes.
Mid - Term Examination	A 60-minutes exam will cover all the material covered during the first 15 lectures	Final Examination	A 120-minutes exam will cover all the material covered during the semester.
Attendance Policy	Students missing more than 20% of the lectures will receive an "SA" grade in the course and will not be allowed to take final exam.		



MEDICAL PHYSICS

Lecture Plan (Spring 2019)

Week	Lecture #	TOPICS	CH	SECTIONS
1	1	Static Electricity: Conductors and Insulators	23	1 – 5
	2	Electric Force and Electric Field	24	1 – 7
2	1	Electric Potential Energy	25	1 – 4
	2	The Heart and ECG	25	3 – 7
3	1	Capacitors: Series and Parallel Connections	26	1 – 5
	2	Electric Current: Drift Velocity	27	1 – 6
4	1	Power Sources and Ohm's Law	27	7 – 15
	2	Time Behaviour of RC – Circuits	28	1 – 4
5	1	The Nature of Light	29	1 – 5
	2	Plane and Spherical Mirrors	30	1 – 3
6	1	Lenses and Magnification	30	4 – 6
	2	The Parts of the Eyes	31	1 – 5
7	1	Emmetropia, Myopia, Hypermetropia, Color Vision	31	6 – 10
	2	Superposition and Interference of waves	32	1 – 5
8	1	Diffraction and Thin-Film Interference	32	6 – 10
	2	The Bohr Model of the Atom	33	1 – 4
9	1	Quantum Mechanics	33	5 – 6
	2	Nuclei and Isotopes	34	1 – 3
10	1	Nuclear Decay and Stability	34	4 – 5
	2	Production of Ionising Radiation	35	1 – 3
11	1	Other Sources of Radiation	35	4 – 5
	2	Attenuation and Cross Section	36	1 – 3
12	1	X-rays and Gamma Radiation	36	4 – 5
	2	Dose and Dose Equivalent	37	1 – 3
13	1	Medical Effects and Risk	37	4 – 6
	2	Medical Imaging	38	1 – 4
14	1	CT Scan, PET Scan, Ultrasound Sonography	38	5 – 7
	2	A brief Outline of MRI	39	1 – 3
15	1	Nuclear Magnetic Resonance	39	4 – 5
	2	Revision	-	-



Medical Physics Lab (PH-106)

Lab Work (Spring 2019)

Lab Policy	Students are expected to perform experiments (as per attached list) related to the course work, analyze the data, draw conclusions, and write a report. Grades will be awarded based on student's lab reports and a final exam in the lab.
Grading Policy for Lab work	Laboratory Reports 14 Marks Final Examination 06 Marks
Make-up Labs	If due to an unavoidable circumstance a student has to miss a Lab, then he/she should obtain an excuse for this from the instructor. The instructor will accept an excuse only if he feels that the student had a genuine reason. In an accepted case the instructor may allow the student to take a make-up session.
Attendance Policy for Lab	Students missing more than 20% of the Labs. (excused or unexcused) will receive an "F" grade in the Lab work.

OVERALL POLICY:

- Student has to pass both Course work and Lab work separately.
- Student failing in the Course work but passing in the Lab work, has to repeat both Course work and Lab work.
- Student failing in the Lab work but passing in the Course work, has to repeat Lab work alone.

List of Experiments

Week	Experiment Title *
1	Lab. Orientation Week
2	DATA ANALYSIS AND PRESENTATION
3	MEASUREMENT OF THICKNESS OF A VERY THIN SAMPLE
4	HORIZONTAL COMPONENT OF EARTH'S MAGNETIC FIELD
5	APPLICATIONS OF PHOTOELECTRIC EFFECT
6	CAPACITORS IN SERIES AND PARALLEL
7	DETERMINATION OF CAPACITANCE OF A CAPACITOR BY A GRAPHICAL METHOD
8	OHM'S LAW
9	WHEATSTONE BRIDGE
10	CONVERSION OF A GALVANOMETER TO VOLTMETER READING UPTO 6 VOLTS
11	CONVERSION OF A GALVANOMETER TO AMMETER READING UPTO 0.2 AMPERE
12	KIRCHHOFF'S LAWS
13	Make-up
14	Final Exam.
15	No Lab

* The listed sequence of the experiments may vary from student-to-student. However, each student must perform all the listed experiments.