Course Syllabus

BMT 224

1. Course number and name: BMT **224/** Applied Physics for Biomedical Technology

2. Credits and contact hours: (3 + 1) credit hours, (3 +2) contact hours

3. Instructor's name: **Mohammad Nisar**

4. Text book, title, author, and year:

   - **Books or notes**: David Halliday, Robert Resnick, Jearl Walker "Fundamentals of Physics Extended", 10th Edition Published by Wiley (2015)

   a. other supplemental materials:

   - - Paul E. Tippens, "Physics", 7th Edition, McGraw-Hill, 2005.
   - Lecture notes available on LMS system

5. Specific course information

   a. brief description of the content of the course:

   This course covers fundamentals of basic physics using algebra and trigonometry as tools. Topics include Units and dimensions, Vectors, Gradient, divergence, and curl, Maxwell equations, Thermodynamics, Work, energy, and power, Fluid mechanics, Sound, Ultrasound: applications in medical, Atomic physics:, spectroscopy, ionizing radiation, Properties of nucleus

   b. prerequisites or co-requisites:

   Pre-requisites: ending preparatory year

   Co-requisites: NA

   c. indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program: **Required**

6. Specific goals for the course

   a. specific outcomes of instruction:

   This course is intended to provide knowledge of basic physics principles and applications. The students should develop the ability to use the basics principles of physics in biological systems. They should be able to apply the basics of thermodynamics, fluid, sound and radiation physics in bio-medical phenomena. Also the students should extend their problem solving abilities.

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

	Course outcome	abet (a-k)
1	Students will demonstrate an understanding of basics of vector analysis, including the concepts of addition and multiplication of vectors.	a, b
2	Students will demonstrate ability to solve problems using different methods of analysis including Gradient, divergence, and curl of a vector, Maxwell equations	a, b
3	Students will demonstrate an understanding of error propagation, temperature and expansion, work, energy, and power.	a, b
4	Students will demonstrate an understanding of the ultrasound, Doppler-effect and their applications in medical field	a, b
5	Students will demonstrate ability to solve the Hydrogen atom and the use of atomic physics and spectroscopy concepts in technology	a, b
6	Students will demonstrate an understanding of the concepts of nuclear physics, uses of isotopes, radio-activity, Half-life, nuclear fission, and fusion.	a, b
7	Students can understand nature and properties of ionizing radiation, their used in medicine and their interaction with matter	a, b
	Most of the topics are targeted in practical sessions in laboratory.	c

7. Brief list of topics to be covered

Topics
Units and dimensions of different physiological parameters, Vectors and scalars, multiplication of vectors
Gradient, divergence, and curl of a vector, Maxwell equations, electrostatics,
Error propagation, uniformly accelerated motion, Solution of acceleration problems, Gravity
Temperature and expansion, Heat transfer mechanisms: Measurement of temperature, Linear, area, and volume expansion, The abnormal expansion of water
Work, energy, and power
Fluids at rest, Density, Pressure, Fluid pressure, Examples of pressure in human organs, Measuring pressure, Archimedes' principle.
Sound: Production of sound waves, Speed of sound, Resonance, Interference and beats, Doppler effect, Ultrasound: applications in medical
Atomic physics: Hydrogen atom, spectroscopy
Nature and properties of ionizing radiation, their used in medicine and their interaction with matter.
Nuclear physics and the nucleus: atomic mass unit, Isotopes, The mass defect and binding energy, Radio-activity, Half life, Nuclear fission, Nuclear fusion.

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
a.	Midterm-1	7	20 %
b.	Midterm-2	13	15 %
c.	Practical exam	14	10%
d.	Practical reports	Bi-weekly	10%
e.	Assignments		5%
f.	Final exam	16	40 %