

GANPAT UNIVERSITY								
FACULTY OF ENGINEERING & TECHNOLOGY								
Programme	Master of Technology				Branch/Spec.	Biomedical Engineering		
Semester	II				Version	1.0.0.0		
Effective from Academic Year		2018-19			Effective for the batch Admitted in		July 2018	
Subject code	3BM205	Subject Name			Advanced Bio-instrumentation & Radiation			
Teaching scheme					Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE	SEE	Total
	L	TU	P	TW				
Credit	3	-	2	-	5	Theory	40	100
Hours	3	-	2	-	5	Practical	30	50
Pre-requisites: Fundamental knowledge of radiation, sensor and electronics instrumentation.								
<b>Learning Outcome:</b>								
<ul style="list-style-type: none"> <li>• Students would get understanding of advanced techniques of X-ray and CT machines used for measuring bone density</li> <li>• Gain ability to use advanced techniques and instruments which supports cardiac OT.</li> <li>• Understanding of advanced techniques and applications of MRI, Ultrasound, Scopes.</li> <li>• Basic understanding of Telemedicine and Robotic surgery.</li> </ul>								
<b>Theory syllabus</b>								
Unit	Content							Hrs
	<b>Introduction to the overview and importance of the course.</b>							
1.	<b>DUAL ENERGY X-RAY ABSORPTIOMETRY BONE DENSITOMETER:</b> Radiography absorptiometry- Bone mineral and soft tissue attenuation coefficients, Single energy x-ray absorptiometry (SXA)- Dual energy x-ray absorptiometry (DXA)- Principal operation, Scanner design, Radiation exposure, Strengths and limitations, Quantitative computed tomography							<b>10</b>
2.	<b>EXTRACORPOREAL BLOOD CIRCULATION AND CARDIAC ASSIST DEVICES:</b> Extracorporeal medical procedures, Extracorporeal membrane oxygenation in cardiac arrest, Ventricular assist device, Intra-Aortic Balloon Pump, Cardio-Pulmonary Bypass and Heart Lung Machine.							<b>9</b>
3.	<b>ADVANCED IMAGING AND APPLICATIONS:</b> Ultrasound imaging: Ultrasound contrast agents: Microbubbles. Ultrasound applications: Obstetrics and gynaecology, Echocardiography. Functional MRI, MRI contrast agents, MRI applications: Neurology, cardiology and musculoskeletal.							<b>9</b>
4.	<b>INSTRUMENTS OF EYES AND EARS:</b> ERG, EOG, Ophthalmoscopy, Otoscopy.							<b>5</b>
5.	<b>MEDICAL DIAGNOSTIC SCOPES:</b> Physics of fiber optics, Fiber modes- Transmission, Endoscopic imaging, Colonoscopy, Bronchoscopy, Surgical scopes.							<b>6</b>
6.	<b>TELEMEDICAL APPLICATIONS:</b> Introduction to Telemedicine and Telehealth, Methodology, Telemedicine, Solutions, Future advances. Introduction to robotics surgery, Perceived Benefits, Potential challenges, Alternative to Robots in surgery, Future aspects.							<b>6</b>
<b>Practical content:</b> Term Work and Practical shall be based on the above syllabus.								
<b>Text Books:</b>								
1	Biomedical Instrumentation Systems By Shakti Chatterjee, Aubert Miller							
2	Introduction to Medical Imaging: Physics, Engineering and Clinical Applications By Nadine Barrie Smith, Andrew Webb							
<b>Reference Books</b>								
1	Telemedicine P. Whitten By B.Holtz; C. LaPlant							
2	Bone Densitometry in Clinical Practice: Application and Interpretation By Sydney Lou Bonnick							
3	Robotic Surgery – A Personal View of the Past, Present and Future By Brian Davies							

**Note:**

Version 2.0.0.0 (First Digit= New syllabus/Revision in Full Syllabus, Second Digit=Revision in Teaching Scheme,Third Digit=Revision in Exam Scheme, Forth Digit= Content Revision)

L=Lecture, TU=Tutorial, P= Practical/Lab., TW= Term work, DT= Direct Teaching, Lab.= Laboratory work

CE= Continuous Evaluation, SEE= Semester End Examination