GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. SEMESTER : VIII

BIOMEDICAL ENGINEERING

Subject Name: **ADVANCED MEDICAL TECHNIQUES (AMT)**

Sr. No.	Course Contents	Total Hrs
1.	**Biosignal analysis and imaging:** **Biosignal Analysis:** Arrhythmia detection and classification, Heart rate variability measurement, analysis and applications. EEG signal Analysis and diagnostic applications,	4
	Biomedical Imaging: Fundamental and Standards of Compression & Communications, Medical Image Achieve and Retrieval, Image Standardization in PACS, Data Registration and Fusion, Content based data retrieval Techniques. Image Reconstruction Techniques; CT image Reconstruction, Algebraic Method, Back Projection and Filtered Back projection Method, Reconstruction of MRI Images.	5
2.	**LASER and its medical applications:** **Application of Lasers in therapy and diagnosis-** Introduction, laser assisted diagnosis and therapy fundamentals, Interaction of Laser beams and materials, principles, Laser interaction with tissue, application of Lasers in Diagnosis and imaging, Laser surgery and therapy, thermal interaction between laser and Tissue.	5
	Single Optical Fibers: Optical fibers-fundamental, Light transmission in Optical fibers, optical properties of optical fibers, The fabrication of optical fibers-principles, special optical fibers for UV, Visible and IR Light –principles, Poer transmission through optical fibers-principles.	5
	Endoscopy: Introduction, Endoscopic imaging system-fundamentals, Endoscopic imaging systems-principles, Endoscopic imaging-advances, Endoscopic diagnostic-advances, Endoscopic therapy- fundamentals, Endoscopic ultrasound Imaging-principles.	5
	Fiber Optic Diagnosis: Fiber optic medical Diagnosis-fundamentals, Fiber optic biomedical sensors-principles, Direct fiber optic sensors- principles, Indirect fiber optic sensors- principles, Biochemical fiber optic sensor-principles.	5
	Fiber Optic Laser system for Diagnostics and therapy: Laser fiber Integrated systems-fundamentals, Components, subsystems and systems-principles, The delivery of high power laser light through Optical fiber-principles, Integrated Laser-fiber systems and their applications-principles, Operation of practical fiber optic laser system-principle, complications in the use of laser optic systems-principles.	6
	Clinical applications of fiber optic Laser systems: Fiber optic Laser system in cardiovascular disease , Fiber optic Laser system in Gastroenterology , Fiber optic Laser system in general and thoracic surgery , Fiber optic Laser system in Neurosurgery , Fiber optic Laser system in Oncology , Fiber optic Laser system in Opthalmology , Fiber optic Laser system in Orthopedics, Fiber optic Laser system in Otolaryngology, Fiber optic Laser system in Urology, Flow chart diagrams for clinical applications of laser –fiber systems.	6
3.	**Minimally Invasive Cardiovascular Technologies:** Angioplasty, stents, Embolic Filters, Cardiac ablation Catheters, Aneurysm Treatment.	4
4.	**Hyperbaric Oxygen Therapy:** Introduction, Indication and Outcomes of Hyperbaric Oxygen Therapy.	4
5.	**Image Guided Thermal Therapy:** Thermal Therapy, Image Guided Thermal Therapy, Delivery Strategies for Image Guided Thermal Therapy.	4

The Practical and Term work will be based on the topics covered in the syllabus.

Text Books:

1. Bankman, Isaac, N., "Handbook of Medical Imaging: Processing and Analysis", Academic Press, 2000.
2. Webster, J., G., " Encyclopedia of Medical Devices and Instrumentation", Vol. I – IV, PHI Publications, 2003.
3. Pianykh Oleg, S., "Digital Imaging and Communications in Medicine", Springer Publication, 2008.
4. Moore, Jamese, & Zoruridakis, George, "Handbook of Biomedical Technology and Devices", CRC Press, 2004.

Reference:

1. Semmlow, John, L., "Biosignal and Medical Image Processing", CRC Press, 2nd Edition, 2008.
2. Rangayyan, M, Rangaraj, "" Biomedical Image Analysis", CRC Press, 1st Edition, 2004.
3. Encyclopedia of biomaterials and biomedical imaging by wnek & boelin