19BMO501T INTRODUCTION TO BIOMEDICAL ENGINEERING

3 0 0 3

INTRODUCTION TO BIOLOGY: Engineering in modern medicine, Physiological Systems-Cell Structure, Structure of nerve cell and functions, Heart & Circulatory system, Respiratory Physiology, Kidney function, Brain & Central Nervous System. (9)

BIO PHYSIOLOGICAL SIGNALS: Signal representation, Signal analysis in time and Frequency domain, Signal Estimation, Bioelectric Signals: Electrocardiogram & Electroencephalogram, Vital Signs, Bio magnetic Signals. (9)

MEDICAL IMAGING SYSTEMS& EMERGING TECHNOLOGIES: Principles and Applications - X-ray & CT, Ultrasound Imaging, MRI, Nuclear Medicine, Microscopy, Biophotonics, Optical Biosensors, Carbon Nano Tubes, Quantum Dots, MEMS, Neuroengineering. (9)

BIOMECHANICS & BIOMATERIALS: Mechanical Properties of Tissue - Stress, Strain, Viscosity and Viscoelasticity, Applications of Sports Biomechanics, Biomaterials - Types, Properties, Applications - Artificial heart & Membrane Oxygenators.(9)

SOCIAL AND ETHICAL ISSUES RELATED TO BIOMEDICAL ENGINEERING: Principles of clinical research, randomized controlled trials, Technology and community, Environmental aspects of technology related to healthcare delivery, Healthcare economics and health rationing.(9)

Total L: 45

TEXT BOOKS:

1. John D. Enderle and Susan M. Blanchard, “Introduction to Biomedical Engineering”, Elsevier International Projects Ltd., Boston, 2005.
2. Laurence J. Street, “Introduction to Biomedical Engineering Technology”, CRC Press, London, 2008.

REFERENCES:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.
2. John G. Webster, “Medical Instrumentation: Application and Design”, John Wiley and sons, New York, 2007.
3. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, John Wiley & Sons, New York, 2008.

19BMO502T WEARABLETECHNOLOGIES

30 0 3

INTRODUCTION TO WEARABLE AND HAPTICS: Attributes of wearables, Meta-wearable, Challenges and opportunities, Future of wearables - Social aspects ofwearabilityandinteraction:SocialinterpretationofAesthetics-Casestudy:Googleglass-Wearablehaptics:Needforwearblehapticdevices-Categoriesofwearablehapticandtactile display-Wearablesensorimotor enhancer. (9)

WEARABLE SENSORS DESIGN AND CHALLENGES: Chemical and Biochemical sensors, System design, Challengesinchemical biochemicalsensing,Applicationareas-Inertiasensors,Parametersfrominertiasensors - Applications for wearable motion sensors - Measurementofenergyexpenditurebybodywornheatflow sensors. (9)

FLEXIBLE ELECTRONICS: Introduction, Thin-film transistors: Materials and Technologies, Review of semiconductors in flexibleelectronics-Low-powerIntegratedCircuitDesignforbiopotentialsensing:Analogcircuitdesigntechniques-Low-powerdesignforADCs-Digitalcircuitdesigntechniques-Architectural designforlow-powerbiopotentialacquisition,Practicalconsiderations.(9)

ENERGY HARVESTING SYSTEMS: Energy harvesting from human body: Temperature gradient, Foot motion - Wirelessenergytransmission-EnergyharvestingfromlightandRFenergy-Energy andpowerconsumptionissues, Futureconsiderations.(9)

MONITORINGPHYSICALANDPHYSIOLOGICALPARAMETERS: Wearablesensors for physiological signalmeasurement - Physical measurement: Cardiovascular diseases, Neurological diseases, Gastrointestinal diseases - Wearable andnon-invasive assistive technologies: Assistive devices for individuals with severe paralysis, Wearable tongue drive system,Dual-modetonguedrivesystem. (9)

TotalL: 45

TEXTBOOKS:

1. EdwardSazonov,MichaelRNeuman,"WearableSensors:Fundamentals,ImplementationandApplications",AcademicPress, Edition 2,USA,2020.
2. Tom Bruno , "Wearable Technology: Smart Watches to Google Glass for Libraries", Rowman& Littlefield Publishers,Lanham,Maryland,2015.

REFERENCES:

1. RaymondTong,"WearableTechnologyinMedicineandHealthCare",AcademicPress, USA,2018.
2. HaiderRaad,"TheWearableTechnologyHandbook",UnitedScholarsPublication,USA,2017.
3. AnnalisaBonfiglio,DaniloDeRossi,"WearableMonitoringSystems",SpringerScience&BusinessMedia,USA,2011.
4. Röcker, Carsten , "Smart Healthcare Applications and Services: Developments and Practices: Developments and Practices",IGIGlobal,USA,2010.

19BMO503T MEDICALROBOTICS

30 0 3

INTRODUCTION : Introduction to medical robotics (applications and paradigms), Basic kinematics concepts (forward, inverse, remote center of motion)Basic control concepts (impedance, admittance)Surgery for engineers, Interventional radiology for engineers (9)

MINIMALLY INVASIVE SURGERY (MIS): Human-machine interfaces, Teleoperation, Cooperative manipulation, Port placement for MIS, Robot design concepts, Video images in MIS, Augmented reality. (9)

IMAGE-GUIDED INTERVENTIONS: Medical imaging modalities (e.g., MRI, US, X-ray, CT), Robot compatibility with medical imagers, Image segmentation and modeling, Tracking devices, Frames and transformations, Surgical navigation, Calibration, Rigid and non-rigid registration, Radiosurgery (9)

ROBOTS IN CLINICAL & NON CLINICAL APPLICATIONS: Cardiac, abdominal, and urologic procedures with tele operatedrobots, Orthopedic surgery with cooperative robots, Prostate interventions with manual “robots”, Robotic catheters for heart electrophysiology.(9)

ROBOTS IN HEALTH CARE: Modular robots, Service robots, Social robots, Mobile robots and Autonomous robots (9)

Total : 45

TEXTBOOKS:

1. JohnJ. Craig,"IntroductiontoRobotics:MechanicsandControl",PrenticeHallofIndia,NewDelhi,2018.
2. AchimSchweikard,FlorisErnst,"MedicalRobotics", Springer,NewYork,2015.

REFERENCES:

1. JocelyneTroccaz,"MedicalRobotics",Wiley-ISTE,USA,2013.
2. SaeedBNiku,"IntroductionToRobotics:Analysis,Systems,Applications",PearsonEducation,NewDelhi,2010.
3. DanielR.Faust,"MedicalRobots", TheRosen PublishingGroup,NewYork,2017.
4. BrunoSiciliano,LorenzoSciavicco,LuigiVillani,"Robotics:Modelling,PlanningandControl",Springer-Verlag,NewYork,2011.