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Teaching Experience in Biotransport Course for Undergraduates of Biomedical Engineering

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For undergraduate student in biomedical engineering, they usually have very limited background of thermodynamics, heat mass transfer. Fundamental concepts of heat and mass transfer, thermodynamics are necessary at the beginning of the course. For this purpose, we found that Prof. John Chato's book "Fundamentals of Bioheat Transfer" provides good text and it has been used successfully through our teaching. For example, after introducing the energy conservation law, a focused discussion on how the law is used in biological systems (how energy is generated from bio-chemical reactions, et.al) can be launched. Thermal resistance method and radiation network are easily accepted by the BME students as they have strong electrical background. Vasculature is one of the most important factors in bioheat transfer. It is also important in biomedical engineering field. Thus, the anatomic structure, quantification, thermal equilibrium length of blood vessels, are all taught in details. The Pennes equation and its applications are certainly necessary topics and taught right after the temperature measurement technique session. Medical applications, including hyperthermia, thermal ablation, cryosurgery, cryopreservation, burn evaluation etc. are given from both experimental and theoretical points of view. At the end, successful commercial products and models are also introduced.