MATERIAL SCIENCE (MTSC)

MTSC 615. Structure of Solids. 3 Credits.
Crystallography, reciprocal lattices, Bloch waves, band structure, electronic wave functions, phonons, thermal expansion. Superlattice structures, including liquid crystals. Overview of properties of ceramic, amorphous, polymeric, and composite materials.

Grading status: Letter grade.

MTSC 715. Visualization in the Sciences. 3 Credits.
Computational visualization applied in the natural sciences. For both computer science and natural science students. Available techniques and their characteristics, based on human perception, using software visualization toolkits. Project course.

Same as: COMP 715, PHYS 715.

MTSC 720. Materials Fabrication. 3 Credits.
Permission of the department. Introduction to materials fabrication and characterization techniques. Includes single crystal growth, thin film deposition, synthesis of quantum dots and nanotubes/nanowires, dielectric and electron emissive materials, nanocomposites, bioceramics, and energy storage materials.

MTSC 730. Statistical Thermodynamics. 3 Credits.

MTSC 735. Techniques in Materials Science. 3 Credits.
Permission of the department. Lecture and laboratory in materials analysis techniques, including microscopy, X-ray diffraction and fluorescence, magnetic resonance, thermal analysis, XPS, channeling and RBS, mechanical properties, optical spectroscopy.

Repeat rules: May be repeated for credit.

MTSC 740. Advanced Biomaterials. 3 Credits.
Medical or dental implants or explants are highlighted from textbooks, scientific literature, and personal accounts.

Requisites: Prerequisite, BMME 510; Permission of the instructor for students lacking the prerequisite.

Same as: BMME 740.

MTSC 750. Kinetics, Diffusion, and Phase Transitions of Materials. 3 Credits.

MTSC 810. Device Physics and Electronic Properties of Solids. 3 Credits.
Survey of crystal structure, band structure, transport. Overview of FETs, heterostructures, light emission, dissipation, noise, integrated circuits, solar cells, and ceramics. Emphasis on physical sources of device behavior.

Requisites: Prerequisites, APPL 470 or PHYS 573, MTSC 615, and 730; permission of the instructor for students lacking the prerequisites.

MTSC 820. Optical Properties of Solids. 3 Credits.
Reflection, waveguides, nonlinear optics, optical switching, photorefraction, optical storage. Optical coupling to electronic states, device applications, optical computing.

Requisites: Prerequisites, APPL 470 or PHYS 573, and PHYS 415; permission of the instructor for students lacking the prerequisites.

MTSC 830. Ion-Solid Interactions. 3 Credits.
Interatomic potentials, range distribution, radiation damage, annealing, secondary defects, analytical techniques, silicon-based devices, implantation in compound semiconductors, and buried layer synthesis. Ion implantation in metals, ceramics, polymers, and biomaterials.

Requisites: Prerequisite, APPL 470 or PHYS 573; permission of the instructor for students lacking the prerequisite.

MTSC 840. New Technologies and Device Architecture. 3 Credits.

Requisites: Prerequisites, APPL 470 or PHYS 573, MTSC 615, and 730; permission of the instructor for students lacking the prerequisites.

MTSC 871. Solid State Physics. 3 Credits.
Topics considered include those of PHYS 573, but at a more advanced level, and in addition a detailed discussion of the interaction of waves (electromagnetic, elastic, and electron waves) with periodic structures, e.g., X-ray diffraction, phonons, band theory of metals and semiconductors.

Requisites: Prerequisite, PHYS 321.

Same as: PHYS 871.

MTSC 872. Solid State Physics. 3 Credits.
Topics considered include those of PHYS 573, but at a more advanced level, and in addition a detailed discussion of the interaction of waves (electromagnetic, elastic, and electron waves) with periodic structures, e.g., X-ray diffraction, phonons, band theory of metals and semiconductors.

Requisites: Prerequisite, PHYS 321.

Same as: PHYS 872.

MTSC 891. Special Topics in Material Science. 1-3 Credits.
Permission of the department. Current topics in materials science, including electronic and optical materials, polymers, and biomaterials.

MTSC 992. Master's (Non-Thesis). 3 Credits.

MTSC 993. Master's Research and Thesis. 3 Credits.
Permission of the department.

Repeat rules: May be repeated for credit.

MTSC 994. Doctoral Research and Dissertation. 3 Credits.
Permission of the department.

Repeat rules: May be repeated for credit.