PROJECT NUMBER	SUPERVISOR	FIELD	TITLE/DESCRIPTION	CONTACT
1	Dr. Matt Benacquista	astronomy/ astrophysics	Observations of Compact Binaries in Globular Clusters - There have been many observational campaigns directed at detecting the population of binary systems containing white dwarfs, neutron stars, and black holes within the Galactic globular cluster system. This project would perform a literature search of recent observations and produce a small catalog listing the numbers and types of compact binaries for each globular cluster in the Galactic system.	benacquista@phys.utb.edu
2	Dr. Mario Diaz	astronomy	Observation of Sunspots - Students will observe sunspots and compared their observations with NASA data. This project will require time at the Nompuewenu Observatory at UTB.	mario@phys.utb.edu
3	Dr. Mario Diaz	astronomy	Observation of Variable Stars - Students will record the variable luminosity of variable stars to obtain the period of variation and other information and compared it with existing records. This project will require time at the Nompuewenu Observatory at UTB.	mario@phys.utb.edu
4	Dr. Mario Diaz	astronomy	Radio Telescope - Construction of a radio telescope to observe molecular hydrogen distribution in the galaxy.	mario@phys.utb.edu
5	Dr. Camas Key	nanomaterials	Nano-Thermoelectic Materials - The sudent will work in the nano labs at UTB discovering some of the properties and uses of nano-thermoelectric materials including hybrid energy storage.	ckey@phys.utb.edu
6	Dr. Joey Shapiro Key	astrophysics	Space Based Gravitational Wave Astronomy - At the center of each galaxy resides a supermassive black hole with a mass over a million times the mass of our sun. When galaxies collide the supermassive black holes at their centers eventually orbit one another and emit gravitational waves that could be detected by a gravitational wave detector in space. The student will study the design developed by NASA and the European Space Agency (ESA) to lauch a mission that could detect the gravitational waves from pairs of supermassive black holes orbiting each other and eventually colliding in the most energetic events in the universe.	jkey@phys.utb.edu
7	Dr. Joey Shapiro Key	astronomy	Solar Spectroscopy - The spectrum of light from the sun can be studied using a prism or diffration grating. The student will study the features of the solar spectrum and understand their origins.	jkey@phys.utb.edu
8	Dr. Karen Martirosyan	nano-scale science	Advanced Nanostructured Materials and Devices - We humans live on a scale of meters and kilometers, so it's quite hard for us to imagine a world that's as small as nanometer scale. Making new things on this incredibly small scale is called nanotechnology or nanoscale science and it's one of the most exciting and fast-moving areas of science and technology today. This multitask project will allow students to review the fundamental understanding of fabrication of nanomaterials and nanostructured devices for energy, environment and biomedical applications.	Karen.Martirosyan@utb.edu

9	Dr. Karen Martirosyan	nano-scale science	Propulsion and Explosive NanoSystems - Most of nanotechnology's benefits will happen decades in the future, but it's already helping to improve our world in many different ways. For example nanoenergetic materials can be used for many aerospace and military applications. The main subject of this project is to review the physics based knowledge in energy release, shock waves and pressure discharge needed to enhance the performance and functionality of highly energetic nanostructured systems to apply their insertion in several propulsion and explosive systems.	Karen.Martirosyan@utb.edu
10	Dr. Karen Martirosyan	biophysics and nano-scale science	Nanoparticles for Cancer Therapy and Imaging - We tend to think of nanotechnology as something new and alien, perhaps because the word "technology" implies artificial and human- made, but nature itself is an example of nanotechnology: proteins, bacteria, viruses, and cells all work on the nanoscopic scale. This project will allow student to learn about superparamagnetic phenomena arising from finite size and surface effects that dominate the magnetic behavior of individual nanoparticles that designed to use in cancer therapy, drug delivery and advanced imaging.	Karen.Martirosyan@utb.edu
11	Dr. Karen Martirosyan	lunar and planetary science	Advanced Materials for Lunar Exploration Program - As major space agencies from US, Europe, Russia, and China turn their exploration ambitions towards the Moon, the research and development of new technologies for Lunar operations require meeting a fast pace schedule, reminiscent of the 1960's Apollo program. Fabrication of structural and refractory materials from in-situ lunar resources (metals, ceramics, or composite-based materials) will be essential for enabling extended human presence on the Moon.	Karen.Martirosyan@utb.edu
12	Dr. Volker Quetschke	lasers	The Laser - History and Applications - From high precision metrology to medical applications, a lot of modern technology would not be possible without the invention of the laser. In this project the student will describe the core elements that constitute a laser, its history and showcase applications that use its unique properties.	Volker.Quetschke@utb.edu
13	Dr. Volker Quetschke	optics	Input optics for LIGO - LIGO is the first detector capable for direct observation of gravitational waves. Gravitational waves, as predicted by Einstein, are the distortions of spacetime itself but manifest themselves as tiny length changes of measurable distances. In this project the student will describe the technologies that are necessary to prepare a laser beam with sufficient quality to be used for interferometric gravitational wave detection - such as with LIGO - and showcase the achievements of LIGO's input optics.	Volker.Quetschke@utb.edu

14	Dr. Joe Romano	cryptogrophy	Cryptography---the art of secret communication---has been around for countless centuries, used whenever someone wants to hide the meaningofaprivatemessagefromintrudingeyes. Inthisproject, the student will survey several of the algorithms used to encipher and decipher messages, including the RSA algorithm and PGP (Pretty Good Privacy) protocol used to keep our internet transactions safe from eavesdroppers. This project requires basic computer programming skills on the part of the student.	joe@phys.utb.edu
15	Robert Stone	gravitational wave detector/ seismic studies	Keep the Noise Down! - The Laser Interferometer Gravitational-Wave Observatory (LIGO) can (amazingly!) measure distances smaller than a proton diameter, but it is extremely sensitive to seismic activity. In this project students will investigate how different kinds of seismic noise (earthquakes, ocean tides, traffic, storms, etc.) affect LIGO's search for gravitational waves, how the seismic noise is monitored, and what steps are taken to limit its effect.	rstone@phys.utb.edu
16	Dr. Ahmed Touhami	nanoscience/ nanotechnology	Atomic Force Microscopy - Nanotechnology is going to significantly change our future. Some prognoses say that its impact on our lives will rival that brought about by the steam engine, electricity, the transistor, and the internet. One of the most important acronyms in nanotechnology is Atomic Force Microscopy (AFM). This instrument has become the most widely used tool for imaging, measuring and manipulating matter at the nanoscale. In the present project the student will learn, manipulate, and practice the physics behind this sophisticated microscope. The student will also enhance his understanding on resonance, standing waves, simple harmonic motion, and light reflection.	ahmed.touhami@utb.edu
17	Dr. Ahmed Touhami	nanoscience/ nanotechnology	Optical Tweezers - Nanotechnology is going to significantly change our future. Some prognoses say that its impact on our lives will rival that brought about by the steam engine, electricity, the transistor, and the internet. One of the most important acronyms in nanotechnology is Optical Tweezers. This instrument has become the most widely used tool for measuring and manipulating forces and distances in many systems at the nanoscale level. In the present project the student will learn how light applies forces on tiny object like proteins and bacteria and how scientists utilize this sophisticated instrument to unravel the mechanisms of different biological phenomena. The student will enhance his understanding of optics, lasers, molecular forces, fields, and light reflection.	ahmed.touhami@utb.edu

18	Dr. Ahmed Touhami	nanoscience/ nanotechnology	Fluorescence Microscopy - The power and capability of the light microscope has increased dramatically over the last few years. This change has been driven by the need to study increasingly sophisticated problems at high spatial and temporal resolution. The advances, principally in the field of fluorescence microscopy have been dependant on the development of entirely new microscopic methodologies coupled to the use of fluorescent proteins, new fluorescent dye technologies, highly sensitive detectors and inexpensive powerful computers. In this project the student will learn the theory and principles of the high resolution light imaging, potential application and implementation of fluorescence imaging techniques, and more importantly, this will be couched in the real world application of biological experimentation.	ahmed.touhami@utb.edu