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2021 Coorstek DMRSEF Categories

**ANIMAL SCIENCES:** This category includes all aspects of animals and animal life, animal life cycles, and animal interactions with one another or with their environment. Examples of investigations included in this category would involve the study of the structure, physiology, development, and classification of animals, animal ecology, animal husbandry, entomology, ichthyology, ornithology, and herpetology, as well as the study of animals at the cellular and molecular level which would include cytology, histology, and cellular physiology.

Subcategories:

Animal Behavior Genetics Cellular Studies Nutrition & Growth

Development Physiology Ecology Systematics & Evolution

**BEHAVIORAL SCIENCES:** The science or study of the thought processes and behavior of humans and other animals in their interactions with the environment studied through observational and experimental methods.

Subcategories:

Cognitive Psychology Clinical & Developmental Psychology

Neuroscience Physiological Psychology

**BIOLOGICAL SCIENCES:**

BIOCHEMISTRY: The study of the chemical basis of processes occurring in living organisms, including the processes by which these substances enter into, or are formed in, the organisms and react with each other and the environment.

Subcategories**:**

Analytical Biochemistry General Biochemistry
Medicinal Biochemistry Structural Biochemistry

CELLULAR AND MOLECULAR BIOLOGY: This is an interdisciplinary field that studies the structure, function, intracellular pathways, and formation of cells. Studies involve understanding life and cellular processes specifically at the molecular level.

Subcategories**:**

Cell Physiology  Cellular Immunology Genetics

Molecular Biology Neurobiology

**MEDICINE & HEALTH SCIENCES:**

BIOMEDICAL AND HEALTH SCIENCES**-**This category focuses on studies specifically designed to address issues of human health and disease. It includes studies on the diagnosis, treatment, prevention or epidemiology of disease and other damage to the human body or mental systems. Includes studies of normal functioning and may investigate internal as well as external factors such as feedback mechanisms, stress or environmental impact on human health and disease.

Subcategories:

Pathophysiology Cell, Organ, and Systems Physiology Nutrition and Natural Products

Immunology Genetics and Molecular Biology of Disease

TRANSLATIONAL MEDICAL SCIENCE-Projects that aim to improve human health and longevity by translating novel discoveries in the biomedical sciences into effective activities and tools for clinical and public health use. Bi-directional in concept, projects can be those developed through basic research moving toward clinical testing (bench-to-bedside) or projects that provide feedback about the applications of new treatments and how they can be improved (beside-to-bench).

Subcategories:

Disease Detection and Diagnosis Disease Prevention Pre-Clinical Studies

Disease Treatment and Therapies Drug Identification and Testing

**CHEMISTRY:** Studies exploring the science of the composition, structure, properties, and reactions of matter not involving biochemical systems.

Subcategories:

Analytical Chemistry Computational Chemistry Organic Chemistry Physical Chemistry

Inorganic Chemistry Materials Chemistry Physical Chemistry Environmental Chemistry

**COMPUTER SCIENCES AND MATHMATICS:**

COMPUTATIONAL BIOLOGY AND BIOINFORMATICS: Studies that primarily focus on the discipline and techniques of computer science and mathematics as they relate to biological systems. This includes the development and application of data-analytical and theoretical methods, mathematical modeling and computational simulation techniques to the study of biological, behavior, and social systems.

Subcategories**:**

Computational Biomodeling Computational Epidemiology  Computational Evolutionary Biology

Computational Neuroscience Computational Pharmacology Genomics

EMBEDDED SYSTEMS: Studies involving electrical systems in which information is conveyed via signals and waveforms for purposes of enhancing communications, control and/or sensing.

Subcategories:

Circuits Internet of Things Networking and Data Communications

Optics Microcontrollers Sensors Signal Processing

MATHEMATICS**:** The study of the measurement, properties, and relationships of quantities and sets, using numbers and symbols. The deductive study of numbers, geometry, and various abstract constructs, or structures.

Subcategories:

Algebra Geometry and Topology Combinatorics, Graph Theory, and Game Theory

Analysis Probability and Statistics Number Theory

SYSTEMS SOFTWARE**:** The study or development of software, information processes or methodologies to demonstrate, analyze, or control a process/solution.

Subcategories:

Algorithms  Cybersecurity Human/Machine Interface Databases

Mobile Apps Online Learning Languages and Operating Systems

ROBOTICS AND INTELLIGENT MACHINES**:** Studies in which the use of machine intelligence is paramount to reducing the reliance on human intervention.

Subcategories:

Biomechanics Cognitive Systems Control Theory

Machine Learning Robot Kinematic

**EARTH AND ENVIRONMENTAL SCIENCES:** Studies of the environment and its effect on organisms/systems, including investigations of biological processes such as growth and life span, as well as studies of Earth systems and their evolution.

Subcategories:

Atmospheric Science Climate Science Geosciences

Water Science Environmental Effects on Ecosystem

**ENERGY:**

CHEMICAL: Studies involving biological and chemical processes of renewable energy sources, clean transport, and alternative fuels.

Subcategories:

Alternative Fuels Solar Materials Computational Energy Science

Fossil Fuel Energy Microbial Fuel Cells Fuel Cells and Battery Development

PHYSICAL**:** Studies of renewable energy structures/processes including energy production and efficiency.

Subcategories:

Hydro Power Nuclear Power Solar

Sustainable Design Thermal Power Wind

**ENGINEERING:**

BIOMEDICAL ENGINEERING: Projects that involve the application of engineering principles and design concepts to medicine and biology for healthcare purposes including diagnosis, monitoring and therapy.  Prominent biomedical engineering applications include the development of biocompatible prostheses, various diagnostic and therapeutic medical devices ranging from clinical equipment to micro-implants, common imaging equipment such as MRIs and EEGs, regenerative tissue growth, pharmaceutical drugs and therapeutic biologicals.

Subcategories:

Biomaterials Biomedical Devices Regenerative Medicine

Biomechanics Biomedical Imaging Cell and Tissue Engineering Synthetic Biology

ENGINEERING MECHANICS**:** Studies that focus on the science and engineering that involve movement or structure.  The movement can be by the apparatus or the movement can affect the apparatus.

Subcategories:

Naval Systems Computational Mechanics Aerospace and Aeronautical Engineering

Control Theory  Ground Vehicle Systems Industrial Engineering-Processing

Civil Engineering Mechanical Engineering

ENVIRONMENTAL ENGINEERING:Studies that engineer or develop processes and infrastructure to solve environmental problems in the supply of water, the disposal of waste, or the control of pollution.

Subcategories:

Bioremediation Recycling and Waste Management Land Reclamation

Pollution Control Water Resources Management

**MATERIALS SCIENCE:** The study of the characteristics and uses of various materials with improvements to their design which may add to their advanced engineering performance.

Subcategories:

Biomaterials Ceramic and Glasses Electronic, Optical, and Magnetic Materials

Nanomaterials Computation and Theory Composite Materials Polymers

**MICROBIOLOGY:** The study of micro-organisms, including bacteria, viruses, fungi, prokaryotes, and simple eukaryotes as well as antimicrobial and antibiotic substances.

Subcategories:

Antimicrobial and Antibiotics Applied Microbiology Bacteriology

Environmental Microbiology Microbial Genetics Virology

**PHYSICS AND ASTRONOMY:** Physics is the science of matter and energy and of interactions between the two. Astronomy is the study of anything in the universe beyond the Earth.

Subcategories:

Biological Physics Atomic, Molecular, and Optical Physics Astronomy and Cosmology

Theoretical Physics Computational Physics and Astrophysics Nuclear and Particle Physics

Instrumentation Condensed Matter and Materials Mechanics

Quantum Computation  Magnetics, Electromagnetics and Plasmas Optics, Lasers, and Masers

**PLANT SCIENCES:** Studies of plants and how they live, including structure, physiology, development, and classification. Includes plant cultivation, development, ecology, genetics and plant breeding, pathology, physiology, systematics and evolution.

Subcategories:

Agriculture and Agronomy Ecology Genetics and Breeding

Growth and Development Pathology Plant Physiology

**SOCIAL SCIENCES:** Sociology and Social Psychology (SOC): The study of human social behavior, especially the study of the origins, organization, institutions, and development of human society. Sociology is concerned with all group activities-economic, social, political, and religious.