

# NMSEF Proposed 14 Categories & Descriptors for 2023

(\* indicates a combined ISEF Category)

## 1. 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
- Cellular Studies
- Development
- Ecology
- Genetics
- Nutrition and Growth
- Physiology
- Systematics and Evolution

## 2. Behavioral and Social 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:

- Clinical & Developmental Psychology
- Cognitive Psychology
- Neuroscience
- Physiological Psychology
- Sociology and Social Psychology

## 3. \* 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. For Biochemistry, this category is 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
- Neurobiology
- Cell Physiology
- Cellular Immunology
- Genetics
- Molecular Biology

#### 4. \* Biomedical, Health Translational Medical 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:

- Disease: Detection, Diagnosis, Prevention, Treatment and Therapies
- Cell, Organ, and Systems Physiology
- Genetics and Molecular Biology of Disease
- Immunology and Pathophysiology
- Nutrition and Natural Products

#### 5. \* Chemistry and Materials Science

Studies exploring the science of the composition, structure, properties, and reactions of matter not involving biochemical systems. As well as the study of the characteristics and uses of various materials with improvements to their design which may add to their advanced engineering performance

##### Subcategories:

- Analytical Chemistry
- Computational Chemistry
- Environmental Chemistry
- Inorganic Chemistry
- Materials Chemistry
- Organic & Organic Chemistry
- Biomaterials
- Composite, Ceramic and Glasses
- Electronic Materials
- Nanomaterials
- Optical and Magnetic Materials
- Polymers

#### 6. \* Computational Biology, Bioinformatics, and Biomedical Engineering

Studies that primarily focus on the discipline and techniques of computer science and mathematics as they relate to biological systems or involve the application of engineering principles and design concepts to medicine and biology for healthcare purposes including diagnosis, monitoring and therapy.

##### Subcategories:

- Biomaterials & Regenerative Medicine
- Biomechanics
- Biomedical Devices
- Biomedical Imaging
- Cell and Tissue Engineering
- Synthetic Biology
- Genomics
- Computational Biomodeling
- Computational Epidemiology
- Computational Neuroscience
- Computational Pharmacology
- Computational Evolution

#### 7. 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 & Water Science
- Environmental Effects on Ecosystems
- Geosciences

## 8. \* Energy

Studies/processes involving the production and/or storage of energy.

### Subcategories:

- Biological Process and Design
- Solar Process, Materials, and Design
- Energy Storage
- Wind and Water Movement Power Generation
- Hydrogen Generation and Storage
- Thermal Generation and Design
- Triboelectricity and Electrolysis

## 9. \* Environmental & Engineering Technology

Studies that focus on the science and engineering that involve movement or structure as well as the 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:

- Aerospace/Aeronautical Engineering
- Civil Engineering
- Computational Mechanics
- Control Theory
- Ground Vehicle Systems
- Industrial Engineering-Processing
- Mechanical Engineering
- Naval Systems
- Bioremediation
- Land Reclamation
- Pollution Control
- Recycling
- Waste Management
- Resources Management

## 10. 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
- Analysis
- Combinatorics, Graph Theory, and Game Theory
- Geometry and Topology
- Number Theory, Probability and Statistics

## 11. 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

## 12. 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:

- Atomic, Molecular, and Optical Physics
- Astronomy and Cosmology
- Biological Physics
- Computational Physics and Astrophysics
- Condensed Matter and Materials
- Magnetism, Electromagnetics and Plasmas
- Mechanics
- Nuclear and Particle Physics
- Optics, Lasers, and Masers
- Quantum Computation
- Theoretical Physics
- Instrumentation

## 13. 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
- Systematics and Evolution

## 14. \* Robotics, Systems Software and Embedded Systems

Studies in which the use of machine intelligence is paramount to reducing the reliance on human intervention and studies or development of software, information processes or methodologies to demonstrate, analyze, or control a process/solution. Also included are studies involving electrical systems in which information is conveyed via signals and waveforms for purposes of enhancing communications, control and/or sensing.

### Subcategories:

- Circuits, Optics, Sensors and Signal Processing
- Internet of Things
- Microcontrollers
- Networking and Data Communications
- Algorithms, Cybersecurity, Databases
- Human/Machine Interface
- Languages and Operating Systems
- Biomechanics
- Cognitive Systems
- Control Theory
- Machine Learning
- Robot Kinematics
- Mobile Apps
- Online Learning