THE SUMMER STEM EXPERIENCE @ NEW MEXICO TECH
About

Welcome to Summer STEM 2024
Immerse yourself in the world of science and engineering during this five-day program at New Mexico Tech. Become a ‘Techie’ for a week, experiencing life as a college student while earning one credit hour and gaining a deep understanding of your chosen STEM field.

Discover Your Path in STEM
Join us for engaging lectures, hands-on labs, and fun field trips led by college professors. You’ll learn about physics, chemistry, computer science, engineering, and more! This program will help you understand what it takes to succeed in these fields and set you on the path to a great career.

Unleash Your Potential at NMT
New Mexico Tech boasts a long-standing reputation for academic excellence, distinguished faculty, and exceptional students. Our campus is a place where you can learn and grow, surrounded by people who want to help you succeed. Tech offers degrees spanning the range of STEM, including physical and biological sciences, computer science, engineering, and mathematics, with research opportunities starting as soon as freshman year.

Cost
ALL INCLUSIVE – for $565, you’ll get everything you need for an amazing experience – food, housing, classes, and fun activities!

Check-in: June 9th or July 14th | Torres Hall | 3 PM to 5 PM
Check-out: June 14th or July 19th | Torres Hall | 10 AM to 12 PM

Requirements and Registration
To join Summer STEM 2024, you need to be a rising sophomore, junior, or senior with a GPA of at least 2.75 (on a 4.0 scale) and have completed Algebra I or higher.

Register online*: apply.nmt.edu/portal/summer_stem

*Classes are assigned on a first-come, first-serve basis. When registering, select a first and second choice, you will be placed into one of these based on availability.

Note: a class can be canceled due to low enrollment.
# Course List

**Choose two | Attend one**

**Session 1 | June 9th - June 14th**

**Session 2 | July 14th - July 19th**

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Session 1</th>
<th>Session 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology: Discovering Biology in the Field and the Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering: Scaling Chemical Discoveries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry: Making a Miniaturized Chemical Sensor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry: The Alchemist’s Garden</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil and Environmental Engineering: Building Resilient Systems for a Changing Climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Science: Python for Data Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Engineering: Transforming Solar Power to Usable Energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials Engineering: Metals, Ceramics, Polymers, and Composites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineering: Drones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineering: Launchpad to the Skies - A One Week Aerospace Course for High School Students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineering: Space Rover Optimization, Programming and Operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mineral Engineering: Mining</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petroleum Engineering: Oil and Gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics: Astronomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>User Experience (UX): Psychology, Communication, and Experimental Design</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Table of Contents

Biology: Discovering Biology in the Field and the Lab ........................................ 7
Chemical Engineering: Scaling Chemical Discoveries ........................................... 9
Chemistry: Making a Miniaturized Chemical Sensor ............................................. 11
Chemistry: The Alchemist’s Garden ...................................................................... 13
Civil & Environmental Engineering: Building Resilient Systems for a Changing Climate ................................................................. 15
Computer Science: Python for Data Science ....................................................... 17
Electrical Engineering: Transforming Solar Power to Usable Solar Electricity .... 19
Materials Engineering: Metals, Ceramics, Polymers, and Composites ............... 21
Mechanical Engineering: Drones ........................................................................... 23
Mechanical Engineering: Launchpad to the Skies – An Aerospace Course ......... 25
Mechanical Engineering: Space Rover Optimization, Programming, and Operations ................................................................. 27
Mineral Engineering: Mining ................................................................................ 29
Petroleum Engineering: Oil and Gas ................................................................. 31
Physics: Astronomy ............................................................................................ 33
Psychology: User Experience (UX) – Communication, and Experimental Design 35
Discovering Biology in the Field and in the Lab

Maximum class size

June and July

Course dates

Dr. Kaarin Goncz

Instructed by

16

Course Description

The field of biology involves the observation and experimentation on living systems. Biologists study nature both in the lab or outside in the field. Often, samples are collected in the field and then research experiments happen in the lab. In this course, students will take field trips to observe and explore the local environment. They will learn how to collect the plants, animals and microbes that populate them. Back in the lab, students will investigate specimens, and will learn about experimental design for testing scientific hypotheses. They will use hands-on laboratory equipment and techniques as well as learn about the Biology research going on at New Mexico Tech.
Scaling Chemical Discoveries

CHEMICAL ENGINEERING

20

Maximum class size

June and July

Course dates

Seth Price

Instructed by

Course Description

Chemical Engineering is the understanding of how chemical reactions occur and how to scale them up from small, batch, bench top quantities to full-scale, continuous industrial production. Chemical engineers at Tech are also involved in many different research topics, including nanomaterials, traumatic brain injury, biofuels, drug delivery, catalysis, biomaterials, carbon dioxide (greenhouse gas) capture using membrane technology, and hydrogen production and utilization. Students in the Chemical Engineering Summer Course will learn how nylon and biodiesel are produced, as well as operate pilot-scale equipment, such as a heat exchanger, distillation column and an absorption column. They will also explore the various research, engineering and testing methods used in chemical engineering.
Making a Miniaturized Chemical Sensor

CHEMISTRY

Course Description
Why is Chemistry called the Central Science? In this course, students will learn how Chemistry integrates with Biology, Biomedical Sciences, and Engineering in developing chemical sensors. They will also learn how chemical reactions can be performed in miniaturized devices with a few microliters of sample instead of conventional test tubes that require several milliliters of samples. Finally, students will build a hand-held chemical sensor to detect a clinically relevant biomolecule using visible light.
The Alchemist’s Garden

CHEMISTRY

20
Maximum class size

July
Course dates

Dr. Jeff Altig
Instructed by

Course Description
From the fragrant to the foul, we will explore the chemistry of the flora we find in our gardens, woodlands and fields. Foxglove; it can cure or it can kill! As the 16th century physician and alchemist Paracelsus observed, “What is there that is not a poison? ... Solely the dose determines that a thing is not a poison.” The berries of the Black Nightshade can be used to make a tasty jam. Eating them directly off the vine can lead to paralysis and death. The Oil of Bitter Orange, Limonene, is used as a fragrance in perfumes as well as a solvent in cleaners. Carvone, extracted from Spearmint, is used to flavor confectionaries. Menthol from Peppermint is used to flavor cigarettes. Is this your cup of Hemlock? Join us as we distill, extract and study the unique chemicals found in the garden just outside your backdoor.
Building Resilient Systems for a Changing Climate
CIVIL & ENVIRONMENTAL ENGINEERING

16
Maximum class size

July
Course dates

Dr. Isabel Morris &
Dr. Clint Richardson
Instructed by

Course Description
This course is focused on exploring practical approaches to addressing climate change impacts on existing and future infrastructure and the role of civil and environmental engineers in realizing sustainable solutions. Topics include recovering energy and resources from wastewater; designing infrastructure for the climate of the future; energy conservation, storage, production, and recovery; electrification, the electric grid, and energy infrastructure; construction materials and building technologies; smart and connected cities; site evaluation for new projects; and exploring practical solutions for the future. In addition to field and lab activities, rotating field trips include visits to field sites.
class Unit(object):
    __init__(self, **kwargs):
        self.name = kwargs.get("name")
        self.damage = kwargs.get("damage")
        self.armor = kwargs.get("armor")
        self.hit_points = kwargs.get("hp")
        self.current_hit_points = kwargs.get("hp")
        self.level = kwargs.get("level")

def attack(self, enemy: 'Unit') -> int:
    # Attack enemy unit. Return number of damage for damage dealing.
    damage_top_limit = self.damage + round(self._damage_top_limit)
    damage_bot_limit = self.damage - round(self._damage_bot_limit)
    calculated_damage = random.randint(damage_bot_limit, damage_top_limit)
    if calculated_damage < 0:
        return 0
    enemy.current_hit_points -= calculated_damage
Python for Data Science
COMPUTER SCIENCE

15
Maximum class size

July
Course dates

Dr. Sana’a Algarabeh
Instructed by

Course Description
This mini-course introduces newcomers to the world of data science and teaches the fundamental skills of using Python. It covers Python’s data types: lists, dictionaries, and tuples. It shows how to use the must-have Python data science libraries, including NumPy, Pandas for data analysis, and Matplotlib for creating visuals of the results. Once students understand how to format and clean their data, they will work on two hands-on projects on astronomy datasets.

Scholarships Available
SIGN UP FOR SUMMER STEM CS AT THE BUZZCAMP WEBSITE
https://nmt.edu/buzzcamp/
Transforming Solar Power to Usable Solar Electricity

ELECTRICAL ENGINEERING

12
Maximum class size

June
Course dates

Chris Pauli
Instructed by

Course Description
We are living in a world where solar energy is exploding in popularity, but there is more to using the power of the sun to make electricity than just setting up solar panels. This mini course covers the basics of solar energy production, looks at how it is implemented, and explores the role of solar in the greater world of renewable energy.
20
Maximum class size

June
Course dates

Dr. T. David Burleigh & Margaret Showalter
Instructed by

Course Description
Do you know why plastic bends but glass breaks? Or why metals are marvelously malleable? How is concrete different from cement? In this Materials Engineering mini-course you will learn how the structure and composition of these materials determines their properties and uses. Explore diverse materials including metals, polymers, ceramics, and composites through a mix of expert lectures and hands-on laboratory experiences. At the intersection of chemistry, physics and mechanical, Materials Engineering is a STEM field that you’ll want to learn more about.
Course Description

In this summer course, students will explore various aspects of unmanned air systems, delving into the novel classification of flying drones, ranging from unmanned air vehicles to smart dusts, representing both ends of the spectrum, each with its defined applications. They will also become familiar with the design challenges of space and marine drones, learn about existing methods to enhance drone endurance, and explore various techniques for control, guidance, navigation, and manufacturing. In addition to theoretical knowledge, students will actively engage in the practical aspects of the course. They will participate in the design process, CAD modeling, aerodynamic analysis, and simulation of a small fixed-wing micro air vehicle using XFLR5 software. Moreover, students will have the exciting opportunity to build multirotor, fixed-wing, as well as bioinspired drones, gaining hands-on experience in bringing their ideas to life.
Launchpad to the Skies: An Aerospace Course
MECHANICAL ENGINEERING

20
Maximum class size

July
Course dates

Dr. Tie Wei
Instructed by

Course Description
Through hands-on activities and interactive learning, students will explore core aerospace engineering principles, including aerodynamics, propulsion, space exploration, and flight mechanics. The course emphasizes inquiry-based projects, enabling students to actively design, build, and test aerospace devices, fostering problem-solving skills and a deeper understanding of aerospace concepts. The primary objective of the course is to spark students’ interest in STEM subjects, inspiring them to consider future educational and career opportunities in STEM-related fields. Moreover, the collaborative group projects will nurture teamwork and communication skills essential in aerospace engineering and NASA’s collaborative work environment. The course also encourages students to think creatively and innovatively through design challenges and competitions, fostering their problem-solving abilities and nurturing a sense of curiosity and exploration. By the end of the course, students will gain valuable insights into aerospace engineering, fueling their passion for STEM and preparing them for exciting future endeavors, including NASA’s cutting-edge missions.
Space Rover Optimization, Programming, and Operations

MECHANICAL ENGINEERING

30
Maximum class size

June and July
Course dates

Dr. Curtis O’Malley
Instructed by

Course Description

Students will be presented with an Apollo 13 type rapid design problem: The hatch to your Mars habitat had a system failure and will only unlock from the outside. You must modify an existing rover with a limited set of available components to exit through the rover hatch and release the personnel door lock.

This course will guide students through the design, fabrication and coding of a robotic sub-system of a NASA style rover. Students will gain an introduction to basic engineering problem-solving techniques and engineering tools such as drafting, coding, fabrication, and more.
16
Maximum class size

July
Course dates

Dr. Navid Mojtabai
Instructed by

Course Description
The students will be introduced to the important role and impact of minerals and raw materials in our daily lives and activities and the challenges in providing these critical minerals to other industries and fast-growing societies. These challenges include technological, economic, social and environmental concerns. Students will learn about discovery of mineral resources, exploration, different mining methods and materials handling, drilling and blasting, environmental issues, stability of surface and underground openings as well as health and safety. Two field trips to active mines are part of class if conditions allow.

Scholarships Available
Course Description

This course is designed to give students an introduction to the oil and gas industry as well as show how the industry impacts the world. In this course students will learn basic concepts and have hands on experience on the following topics: Properties of petroleum fluids, formation of rocks, flow in reservoirs, reservoir energy, drilling, production and hydraulic fracturing. Students will have a chance to play with the full-size drilling simulator, build a monitoring system, design drilling fluids, conduct simple tests on petroleum fluids and formation rocks, and visit research facilities.
Astronomy

PHYSICS

12

Maximum class size

June

Course dates

Dr. Van Romero

Instructed by

Course Description

How did we get here? Where did we come from? How were the earth, moon and sun created?

From ancient tribes to modern civilization, the human race has tried to answer these questions. This mini-course will examine the scientific theories of the universe. The course will start with ancient astronomers and their concept of the universe and progress to our current understanding of the Big Bang and related scientific theories. Both the on-campus Etscorn observatory and the Magdalena Ridge Observatory will be used to observe the night sky. Students will learn the basics of astronomical observations and obtain an understanding of some of the unanswered questions of the universe we live in.
User Experience (UX): Communication, and Experimental Design

PSYCHOLOGY

24
Maximum class size

June
Course dates

Dr. Taffeta Elliott
Instructed by

Course Description
This mini-course is a survey of how human beings apply their senses and language to navigate their environment, collaborate, and use technology. Mini-course projects will include a combination of hands-on creative production and fun activities involving experimental psychology tools and graphic materials, taught by psychology, technical communication, and cybersecurity experts. Activities may include eye tracking experiments, user-centered design exercises, prototyping, investigations of the roles of perception and memory in design, and tasks illustrating some ways in which we treat media, computers, and other technologies as if they were alive.
SCAN ME!

FOR MORE INFO

$565
ALL INCLUSIVE

Contact us
admission@nmt.edu