NCSSM Science

- Angular Momentum
- Torque & Moment of Inertia

Dr. Sam Wheeler
Physics Instructor
What’s Going to Happen?

• Same mass-arms out?

• Same mass-arms in?
• Which object will make it down the ramp first?

• Why?
• Anatomy and Physiology
• Classical Genetics
• Molecular Genetics
• Neurobiology
• Evolution
• Ecology
• Aquatic Ecology
• Evolution w/Advanced Topics
• Molecular & Cellular Biology
• Climate Change Biology
• Immunology
• AP Environmental Science
• AP Biology
• Research Experience in Biology
• Research in Biology
Chemistry

Core:
- Inquiry Chemistry
- General Chemistry
- AP Chemistry
- AP Chemistry Advanced

Electives:
- Analytical
- Organic
- Computational
- Materials
- Medicinal
- Environmental
- Biochemistry
- Research Experience in Environmental Chem
- Research Experience in Nutritional Chemistry
- Research in Chemistry
- Research in Computational Science
Core:
- General Physics
- Physics with Advanced Topics
- AP Physics C

Electives:
- Astronomy
- Astrophysics
- Galaxies and Cosmology
- Modern Physics
- Fluids, Optics, & Thermodynamics
- Research Experience in Physics
- Research in Physics
NCSSM Online Science

- Honors Intro to Systems Thinking
- Honors Agricultural Biotechnology Solutions
- Honors Classical Genetics
- Honors Climate Change Biology
- Honors Energy and Sustainability
- Honors Epidemiology
- Honors Forensic Science
- Honors Earth Processes and Materials
- Honors Intro to Applied Chemistry & Engineering
- Honors Molecular Genetics
- Honors Nanotechnology & Research
- Research Process (Seminar)

Courses (online and residential) are subject to change
Other Unique Opportunities

- Mini-Term
- Seminars
- Clubs
- Competitions
- Professional Mtgs
- Student-run Journal
**Students** -
NCSSM is different!
Talk to adults
Work much harder
Engage in more hands-on learning
Take responsibility for your learning
Read the catalogue to understand our courses

**Parents** -
NCSSM is different!
Transition to college
Academic challenge
Personal responsibility
Independence
Read the catalogue

http://www.mikemack.ca/
Mathematical Power

[Mathematical power] denotes an individual’s abilities to explore, conjecture, and reason logically, as well as the ability to use a variety of mathematical methods effectively to solve non-routine problems.

Precalculus
Function

- \( a(t) = 36 \sin \left( \frac{\pi}{3.1} t \right) \)
- \( b(t) = -6 \cos \left( 2 \cdot \frac{\pi}{3.1} t \right) \)

Number
- \( d = 3.79 \)

Parametric Curve

\[
\begin{align*}
  x &= 36 \sin \left( \frac{\pi}{3.1} t \right) \\
  y &= -6 \cos \left( 2 \cdot \frac{\pi}{3.1} t \right)
\end{align*}
\]
Calculus
Advanced Probability Models
Core Curriculum

- Algebra 3
- Precalculus with Modeling
- AP Calculus and/or AP Statistics
## Other Math Courses

<table>
<thead>
<tr>
<th>Along with Precalculus w/ Modeling</th>
<th>Along with Calculus:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics</td>
<td>Statistics with Advanced Topics</td>
</tr>
<tr>
<td>Finite Mathematics</td>
<td>Mathematical Modeling</td>
</tr>
<tr>
<td>Advanced Mathematical Problem Solving</td>
<td>Modeling with Differential Equations</td>
</tr>
<tr>
<td>Multivariable Calculus</td>
<td>Number Theory</td>
</tr>
<tr>
<td>Complex Systems</td>
<td>Group Theory</td>
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<tr>
<td>Structure &amp; Dynamics of Modern Networks</td>
<td>Graph Theory &amp; Introduction to Proofs</td>
</tr>
<tr>
<td>Research in Mathematics</td>
<td>Combinatorics &amp; Game Theory</td>
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<tr>
<td></td>
<td>Numerical Analysis</td>
</tr>
<tr>
<td></td>
<td>Advanced Probability Models</td>
</tr>
</tbody>
</table>
Research in Mathematics

- Research in Mathematics Mini-Term
  Open to all interested students.

- Research in Mathematics Trimester Course
  Designed for students who have either completed Graph Theory & Introduction to Proofs or equivalent mathematical experience.

- Summer Research in Mathematics

- Advanced Mathematical Topics
  Year long research program working with professors from Duke University. This opportunity is available to students who excel in the Research in Mathematics Trimester Course.
NCSSM Online Mathematics

- AP Calculus AB
- AP Calculus BC
- Explorations in Mathematical Modeling & Research
- Honors Applied Finite Mathematics with Biological Focus
- Honors Applied Finite Mathematics with Social Science Focus
- Honors Multivariable Calculus I with Applications
- Honors Multivariable Calculus with Applications

*courses (online and residential) are subject to change*
Special Opportunities

• Math Club and Math Team

• Math Competitions
  – Moody’s Mega Math
  – Mandelbrot
  – HiMCM
  – State Math Contest
  – ARML
  – Off-Campus Contests

• WISE
Departmental Goals

- Familiarize Students with Engineering and Computer Science
- Prepare them for success in college programs
- Gain important, applicable skills
  - Design
  - Problem solving
  - Communication of ideas
- Some instances of college credit
  - Articulation and credit by examination with some UNC-system schools
Engineering and Computer Science Faculty

• Dr. Joe LoBuglio (Dean)
  • BS, Mechanical and Aerospace Engineering, Princeton
  • ME, Aeronautical and Astronautical Engineering, Stanford
  • PhD, Environmental Engineering, UNC-Chapel Hill
  • Saturn, Massachusetts Water Resources Authority, UNC Water Institute

• Mr. John Kirk
  • BS, Electrical Engineering, University of Kentucky
  • MEM, Washington University, St. Louis
  • McDonnell-Douglas, Boeing

• Dr. Letitia Hubbard
  • BS, Electrical Engineering, Georgia Institute of Technology
  • BS, Chemical Physics, Dual Degree, Spelman College
  • PhD, Biomedical Engineering, Duke University
  • Medtronic
Engineering and Computer Science Faculty

- **Mr. Larry Myers**
  - BS, Electrical Engineering, Purdue University
  - MS, Electrical Engineering, Purdue University
  - Bose, Sony-Ericsson, GE Hitachi Nuclear Energy

- **Mr. David Bryan**
  - Manager, Peter T. Haughton Innovation and Fabrication Laboratory
  - BA, Communication Studies, UNC – Chapel Hill
  - MID, North Carolina State University
  - ShopBot Tools

- **Dr. Garrett Love**
  - BS, Civil and Environmental Engineering, Duke
  - MS, Civil and Environmental Engineering, Duke
  - PhD, Civil and Environmental Engineering, MIT
Engineering and Computer Science Faculty

- Dr. John Morrison
  - AB, Mathematics, Indiana University
  - PhD, Mathematics, University of Texas

- Mr. Keethan Kleiner
  - BS, Computer Science, UNC-Chapel Hill
  - MS, Computer Science, UNC-Chapel Hill
  - Automated Insights

- Rex Jeffries
  - BS, Electrical Engineering, NC A&T State University
  - MS, Electrical Engineering, NC A&T State University
  - PhD, Biomedical Engineering NC State University and UNC-Chapel Hill
  - Nortel Networks
Engineering Courses - Introductory

- Mechanical Engineering
- Electrical Engineering
- Civil/Environmental Engineering
- Biomedical Engineering
- Architecture
- Introductory Robotics
- Fundamentals of Engineering
- History of Engineering and Technology
- Engineering the Modern
- Research Experience in Engineering
Engineering Courses - Advanced

- Statics
- Biomedical Instrumentation
- Circuits
- Research in Engineering
Computer Science Courses

- **Introductory**
  - Web Development
  - Programming with Engineering Applications
  - Introduction to Robotics
  - Databases
- **Intermediate**
  - Procedural Programming
- **Advanced**
  - Java
  - Advanced Java
  - Data Structures
Online Courses

- Honors Aerospace Engineering
- AP Computer Science Principles
- Honors Biomedical Engineering
- Honors Civil & Environmental Engineering

*courses (online and residential) are subject to change*
Peter T. Haughton
Fabrication Lab
A comprehensive lab, bringing capabilities from woodworking to metalworking, plastics, and electronics

- 3D Printing
- Laser Cutting
- 3-Axis CNC Mill and Lathe
- Large and small format CNC Router
- CNC embroidery machine
- Hand bench-top tools
- Electrical work station
- CAD/CAM Training

Shifted schedule to accommodate students

“It’s one of the best labs I’ve ever seen, it compares to the best graduate-level lab.”
“I, not only, learned more about the field of biomedical engineering, but I learned how to develop a research project from beginning to end.” - Kelly Kimble ’15

“The weekly hand-on experiments and projects were intriguing!”

“Every week I felt like an engineer, applying parts of physics, math, chemistry, and biology to help solve real world problems.”

“Biomedical engineering was like no other class I had taken before. It was truly taking information we learned and applying it to solve complex problems.
- Ashlyn Stackhouse ’15

“Taking your class showed me a world of physics and ... how to approach practical problems and how to solve them ... I think I finally get it, the appeal behind being able to build something and design each component with what you know.”
Opportunities Outside the Classroom

• Clubs:
  – Computer Science Club
  – FIRST Robotics Competition
  – National Society of Black Engineers
  – Technology Students Association
  – Durham Area Rocketry Team/TARC
  – Drone Club
  – Zero Robotics Club
Opportunities Outside the Classroom

• Special Study Options
  – Tissue Engineering
  – Biomechanics Research
  – Graphic Design
  – 3D Printer Design & Construction
  – Rocket Science
  – CAD Analysis
  – Mechatronics

• Off-Campus Internships
  – Interns at IBM, SAS
Mini-Term Opportunities

- Computer Graphics
- Biomechanics of Human Movement
- Programming the Arduino Microprocessor
- Electronic Instruments
- Architecture in Berlin
- NASCAR Engineering
Mini-Term Opportunities

• Computer Systems
• Webpage Construction
• x86 Assembly Language
• Cryptography
• Android Apps
Engineering in Action

Robotics Vision System
https://www.youtube.com/watch?v=4KIYdCBdjEg

Rocket Roll Stabilization
https://drive.google.com/file/d/0B1O6UeYfqiJ-enp5NWVlZHR5WkU/view?usp=sharing

Automotive Engineering
https://drive.google.com/file/d/0BzCks-xycNL5QlNOVnNVc3E2Y2c/view?usp=sharing

Bionic Hand
https://drive.google.com/file/d/0BxZE5hKd2jp3M29OUkFvWDMybUE/view?usp=sharing
Welcome to the NCSSM journey...

Καλώς Ήρθατε!

HUMANITIES
Creating a new generation of leaders
NCSSM Humanities

- Literature
- History
- Social Sciences
- World Languages
NCSSM Humanities

- Fine Arts
  - Music
  - Drama
  - Creative Writing
  - Visual Arts
Weaving the Cultural Fabric

- Interdisciplinary Cultural Studies
  - Making connections between and among literature, history, the visual arts, popular culture, economics, politics, literary theory, and historiography
- Academic Writing
Weaving the Cultural Fabric

- **American Studies** (all juniors)

- **Senior courses:**
  - African Studies
  - Asian Studies
  - British Literature/Culture
  - East-West Studies
  - Modern World Fiction
  - Philosophy and Literature in the Twentieth Century
  - Southern Literature/Culture
  - Western Civilizations
  - Western European Cultural Studies
  - Special Topics (Shakespeare Now; Literature of the American West; STEM and the Stage)
Languages and Cultures

- Chinese
- French
- Japanese
- Latin
- Spanish
Global Understanding
(in Intermediate Chinese classes)

• Shared virtual classroom with the Hangzhou Foreign Languages School in China
• Weekly interactive video class meetings
• Annual in-person cultural exchange visits

• Global Understanding Video
Electives

- Economics
- Entrepreneurship
- Psychology
- Sociology;
  - Medical Sociology
- International Relations
- Black Studies
- Women’s Studies
- Topics in History/Social Science
  - The Immigrant Experience Today: What Is an American?
  - The 2016 Presidential Election
Electives

• Film Studies
• Classical Myth
• Poetry Writing
• Fiction Writing
• American Popular Song
• History of Western Music
• Twentieth-century Music History
Fine Arts Electives

- Orchestra
- Wind Ensemble
- Chorale
- Jazz Performance Workshop
- Classical Piano and Guitar: Theory and Practice
- Music Theory and Composition
- Audio and Digital Music Recording
Fine Arts Electives

- Theater Performance Workshop
- Drawing
- Painting
- 3D Design
- Open Studio
- Darkroom Photography
Research

• Research Experience in the Humanities
• Advanced Research in the Humanities
• Research Experience in the Fine Arts
• Summer Research in the Humanities
Online Courses

- Ecocriticism
- International Relations
- 21st Century Media Studies
- Western Political Thought
- Introduction to Entrepreneurship (a new hybrid course)

Courses (online and residential) are subject to change.
Mini-Term Courses

- The New Deal in North Carolina
- Global Brigades: Building Wells and Building Communities in Honduras
- Teaching Kids to Code
- Tennessee Williams: Orpheus of the American Stage
- Animal Rescue SOS
- Oral History and Documentary Film
- Shakespeare’s Plays
- The Civil War: The Western Theatre
Mini-Term Courses

- The West Wing and American Politics
- POTUS: Popular Media Portrayals of the American Presidency
- Brains! The Zombie Horde in Pop Culture
- Gilded Asheville: A Study of Asheville’s Role in the Gilded Age
- Pirates! Studies in the Revolutionary Atlantic
- NCSSM Mini-Terms in
  - China
  - Costa Rica
  - Germany
  - Greece
  - Spain and Portugal
  - Senegal
  - The American West
We channel Athena.

**metis**:  
- To think critically and creatively  
- To weave and carry out strategies  
- To use language in powerful and persuasive ways
What to bring, how to pack

• Curiosity
• Openness
• Commitment
• Courage
A spirit of collaboration and cooperation
You’ll grow in . . .

- Skills and Knowledge
- Understanding
- Receptivity
- Confidence
- Resilience
Learn to let love rather than fear be the motivating force.
... and find joy in the journey.