Have you registered for this event? If not, please follow this link on your smartphone: https://tinyurl.com/stemiscool2019
MTHS STEM Program

- 4 Year Program with Engineering, Math and Science and all other required HS Classes
- 3 Pathways for Students
  - Aerospace
  - Computer Science
  - BioTech
- Strong STEM Clubs/Community
  - After school clubs
  - STEM Parent Group
  - Support from local business community
- College Credits and National Recognition
  - College Board + PLTW Partnership
  - Credit Partnerships with UW, Shoreline CC & Edmonds CC
- Inspire, Engage, and Prepare students for World of STEM
Imagine a world...
Imagine a world...

- Where you operate $20,000 machines before you can drive...
- Where your classwork ask you to create solutions in your life at home
- When the instructor catches you play video games in class and teach you how to improve the game
- Conduct original scientific research, with the support of experts in the field
- Your designs require F.A.A. clearance to test
- You turn food borne bacteria into nightlights
- Where the “next big thing” could be an app you programmed for homework
- Where you learn to fly an RC plane that you designed, build, and improved
Imagine a school where...

● All teachers are passionate about their subject area
● Students are challenged to be independent, creative, and see failure as a step in success
● HS students graduate with a College transcripts full of relevant, transferable credits
● Coursework is overseen by an advisory committee of industry representatives
● The staff are dedicated to preparing students for a profitable and growing STEM job market
● Students take rigorous academic courses, and then successfully apply the concepts in national competitions
Tonight’s Agenda

Part 1: 6:30-7:00 Introduction and student perspective
- Overview of program
- Student perspectives
- First courses in the program

Part 2: 7:00 - 8:00 Student Activities & Parent information
- Parents: Nuts and bolts of the program
- Students: STEM Activities in the HUB

Part 3: 8:00 - 8:30 Tours
- Optional Lab Tours led by STEM Students
STEM Clubs
The Technology Student Association is a national organization with 250,000+ members.

TSA’s 36 competitive events include:
- Engineering
- Computer Science
- Biotechnology
- Writing
- And more

TSA’s projects give students experience with:
- 3D printers
- CNC machines
- Laser cutters
Rocketry

Who Runs The World?

Encouraging Female Involvement in STEM and Exploring Various Areas of Bioscience
Student Experiences

Aerospace Student: Josh Beam

BioTech Student: Alec Raring

CS Students: Saloni Sanger & Stephen Yang
Engineering Instructors

- **Penny Lefavour**
  - Master of Education, Masters of Biology
  - 31 years teaching experience

- **Bryan Smelcer**
  - 6 years Nuclear Propulsion Mechanic
  - 11 years teaching experience

- **James Wilson**
  - Masters of Education in Technology, Nationally Board Certified Teacher
  - 12 years teaching experience

- **Khin Wone**
  - Master of Education in Mathematics/ Bachelor of Science in Computer Science
  - 12 years of teaching experience
Computer Science Foundations
- Progression from block-based to text-based
- Create apps
- Write programs in Python
- Team project/ Story Creation

Robotics 1
- Block and text-based programming languages
- Hardware, Sensors, wiring
- Teamwork/Problem Solving/Troubleshooting
9th Grade - Honors Geometry+

Intro to Engineering Design

- Design, Teamwork, and Problem Solving
- CAD, CNC, Laser cutting, Power tools
- Collaborative projects
Section 2: Time to explore!
Time to move!

Visiting students, you are now invited to join in some fun STEM activities in the HUB!

Follow the MTHS students downstairs, see you in 1 hour!
What is STEM?

Science Technology Engineering Mathematics

Our STEM Education integrates these disciplines into a cohesive learning environment based on real-world applications, teaching teamwork, research, project management, and perseverance.
Why STEM?

- STEM occupations are expected to grow between **6.5 to 28.2%** in 2014-2024, based on the type of STEM jobs.
- STEM occupations typically earn **nearly double the average** for non-STEM occupations.
- Recently there were an average of 3 job seekers for every non-STEM position. In STEM fields, there were 2 job postings for every job seeker.
Why STEM?

STEM College majors are *least* likely to lead to unemployment
Why STEM?

STEM professionals are more often paid above the average wage level at each educational level.

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* For those with a terminal Bachelor's degree working full-time, full-year.
Why STEM?

Washington Colleges/Universities are promoting STEM programs:

- **UW Bothell - School of STEM - Dean Elaine Scott**: “We are working to encourage... our young people to consider careers in math, science, computing or engineering”

- **Washington State University**: “WSU is recruiting new engineering majors and working to retain them once they’ve declared” says Olsen.

- **Edmonds Community College**: 2 and 4-year STEM degree programs; has received many (19) NSF Grants - $1.5M

- **Seattle University - MTHS’ Partner University** with PLTW... 17 undergraduate Science and Engineering programs; 2 Graduate degree programs.

- **Western WA University**: College of Science and Technology has had a combined STEM program for 10 years and is growing fast. **Three of their Engineering Programs just received ABET in 2017.**
Why STEM?

2017 MTHS STEM Graduating Class:
- GPA: 3.5  SAT: 1237
- 100% of our college applicants accepted into 2- or 4-year colleges

2018 MTHS STEM Graduating Class:
- GPA: 3.6  SAT: 1248
- 100% of our college applicants accepted into 2- or 4-year colleges
- Several of our STEM students in recent years have received “Direct Admission” to UW Engineering Colleges

2019 MTHS STEM Graduating Class:
- GPA: 3.51  SAT: 1266
- 100% of our college applicants accepted into 2- or 4-year colleges
- Several of our STEM students in recent years have received “Direct Admission” to UW Engineering Colleges
Why STEM?

Our STEM students have been admitted to:
- Cal Poly
- UW (a few direct admits!)
- WSU
- Georgia Tech
- Embry Riddle
- Seattle University
- US Naval Academy
- Wellesley
- And Many More...

Our STEM students are majoring in:
- Mechanical Engineering
- Electrical Engineering
- Astronautic Engineering
- Computer Science
- Chemical Engineering
- Biology
- BioEngineering
- Physics
- Economics
Our Department’s Focus: Making one’s thinking clear to others while developing mathematical, communication, and collaborative skills

Other Notes:
- Secondary Emphasis: not preparing students for a test, but for work with others
- True Learning: By students who are proficient, our math SBA results are top in Edmonds school district
- Flexibility: Students can jump immediately into Honors (or non-Honors) classes
  ...all the way up to AP Calculus AB and BC
Science Classes at MTHS:
- College in the HS / Advanced Placement courses in:
  - Chemistry
  - Biology
  - Physics
  - Astronomy

Science Curriculum Highlights:
- Emphasis on a “hands-on approach”
- Advanced lab grade equipment:
  - Electronic probes
  - Spectrophotometers
  - Gel electrophoresis

Goals:
- Prepare students for college
- Teach modern ideas
- Teach methods used in advanced scientific laboratories
Computer Science Pathway
Computer Science Pathway

Curricular Highlights:

- Progression of courses from block-style Scratch/App Inventor to text-based languages such as Python and Java
- UW curriculum and offer UW credits in AP Computer Science A. AP credits are also available in AP Computer Science Principles and AP Computer Science A.

Computer Science Instructor

Khin Wone

- B. S in Computer Science (MSU)
- M.A.T in Math Education (UMBC)
- Certification in Math, CTE STEM and Work - Study
- 12 years of teaching experience
Why Choose Computer Science?

Computing is part of everything we do.

- Enables to solve complex and challenging problems
- Makes a positive difference in the world
- Offers many types of careers, opportunities for creativity and innovation
- Has a space for both collaborative work and individual effort
- Is an essential part of well-rounded academic preparation

Future opportunities in computing are without boundaries!

1. Internet, broadband, WWW (browser and html)
2. PC/laptop computers
3. Mobile phones
4. Email
5. DNA testing and sequencing/human genome mapping
6. Magnetic resonance imaging (MRI)
7. Microprocessors
8. Fiber optics
9. Office software (spreadsheets, word processors)
10. Non-invasive laser/robotic surgery (laparoscopy)
11. Open source software and services (e.g., Linux, Wikipedia)
12. Light-emitting diodes
13. Liquid crystal display (LCD)
14. GPS systems
15. Online shopping/ecommerce/auctions (e.g., eBay)
16. Media file compression (jpeg, mpeg, mp3)
17. Microfinance
18. Photovoltaic Solar Energy
19. Large-scale wind turbines
20. Social networking via the Internet
21. Graphic user interface (GUI)
22. Digital photography/videography
23. RFID and applications (e.g., EZ Pass)
24. Genetically modified plants
25. Bio fuels
26. Bar codes and scanners
27. ATMs
28. Stents
29. SRAM flash memory
30. Anti-retroviral treatment for AIDS
<table>
<thead>
<tr>
<th>Grade</th>
<th>STEM Diploma</th>
<th>STEM Honors Diploma</th>
</tr>
</thead>
<tbody>
<tr>
<td>9th</td>
<td>Algebra 1</td>
<td>Honors Geometry (alg 2)</td>
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<tr>
<td></td>
<td>Biology</td>
<td>Biology</td>
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<td></td>
<td>CS Foundations</td>
<td>Intro to Engineering Design</td>
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<td></td>
<td>Robotics 1</td>
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<tr>
<td>10th</td>
<td>Geometry</td>
<td>Hons Alg 2 (Pre-calc)</td>
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<tr>
<td></td>
<td>Chemistry</td>
<td>Chemistry</td>
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<td></td>
<td>Intro to Engineering Design</td>
<td>AP CS Principles</td>
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<tr>
<td>11th</td>
<td>Algebra 2</td>
<td>Pre-Calculus (Calculus AB)</td>
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<td></td>
<td>AP CS Principles</td>
<td>AP Computer Science A</td>
</tr>
<tr>
<td>12th</td>
<td>Pre-Calculus</td>
<td>Calculus AB (Calculus BC)</td>
</tr>
<tr>
<td></td>
<td>Physics</td>
<td>Physics or AP Physics</td>
</tr>
<tr>
<td></td>
<td>AP Computer Science A</td>
<td>English 12 STEM</td>
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<td>English 12 STEM</td>
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</tbody>
</table>
AP Computer Science Principles

- Equivalent to a first-semester introductory college computing course
- AP credit is available for this course
- AP Exam has three assessment
  - Performance Tasks - 40%
    - Explore Performance Task - 16%
    - Create Performance Task - 24%
  - End-of-Course Exam - 60%

% SCORES 3 OR HIGHER

- YOUR GROUP: 83.9%
- SCHOOL: 83.9%
- WA: 71.7%
- GLOBAL: 66.9%
AP CS Principles - Big Ideas

- Creativity (No MCQ)
- Abstraction (19%)
- Data and Information (18%)
- Algorithms (20%)
- Programming (20%)
- Internet (13%)
- Global Impact (10%)
Computational Thinking Practices

- Connecting Computing
- Creating Computational Artifacts
- Abstracting
- Analyzing Problems and Artifacts
- Communicating
- Collaborating
AP Computer Science A

- Equivalent to a first-semester college level course in computer science
- Java Programming Language
- Object-oriented Programming
- AP credit available
- UWHS credits
- 130 Career Areas
- 48 College Majors

% SCORES 3 OR HIGHER

YOUR GROUP | SCHOOL | WA | GLOBAL
---|---|---|---
85.7% | 85.7% | 79.4% | 69.7%
UWHS Credits

- College freshman level course
- Establish a UW transcript
- Access UW libraries

CSE 142 through UWHS
Cost is $260 + $45 (registration fee) = $305 total
Biotechnology Pathway
STEM Diploma

- **9th Grade**
  - Algebra 1
  - Biology
  - Computer Science Foundations or Robotics
  - Intro to Robotics

- **10th Grade**
  - Geometry
  - Biotechnology
  - Chemistry
  - Intro to Engineering Design

- **11th Grade**
  - Algebra 2
  - Anatomy & Physiology or Physics
  - Elective Computer Pathway course

- **12th Grade**
  - Pre-Calculus
  - AP Biology
  - English 12 STEM Bioscience
Honors STEM Diploma

- **9th Grade**
  - Honors Geometry
  - Honors Biology
  - Intro to Engineering Design

- **10th Grade**
  - Honors Algebra 2
  - Chemistry
  - Biotechnology

- **11th Grade**
  - Honors Pre-Calculus
  - AP Chem or AP Physics or Anatomy & Physiology
  - World Language

- **12th Grade**
  - AP Calculus or AP Statistics
  - English 12 STEM
  - World Language
  - AP Bio
Lead Teacher - Penny Lefavour

○ BS in Biology and Music
○ MS in Biology (Molecular Biology)
○ CTE STEM and Work-Study Certification
○ Master of Education in Curriculum, Instruction and Educational Leadership
○ Trained by Amgen to teach Biotechnology Experience
○ SEP Teacher at The Hutch including lab work
○ Summer work at Institute for Systems Biology
○ Work with UW Genome Science writing curriculum
○ Biotechnology Curriculum frameworks writer for OSPI
○ Curriculum writer for Fred Hutch and SCCA
○ Published Field Work
Biotechnology Course

Curriculum Highlights
● DNA extraction and analysis
● Gel Electrophoresis
● PCR
● Chromatography
● Elephant Trunk Analysis/ID
● Bacterial Transformation
● CDC/Ethics
● Hands-on applications
● Medical research/high accuracy skills
● BioExpo Fair - Ldrship development
Job Shadows & Internships

- Biotechnology
  - Job shadow
  - Optional internships (during school & summer)

- AGC BioPath Program
  - After sophomore year, students will be able to apply for a paid internship at AGC Biologics as part of the BioPath Program.
  - Earn credit and get paid.

- STEM English 12
  - Year-long research with a mentor in your field
6 - 17 - 40 - ??
These Science Practices are...
1. The student can **use representations and models** to communicate scientific phenomena and solve scientific problems.
2. The student can **use mathematics appropriately**.
3. The student can **engage in scientific questioning to extend thinking or to guide investigations** within the context of the AP course.
4. The student **can plan and implement data collection strategies appropriate to a particular scientific question**.
5. The student **can perform data analysis and evaluation of evidence**.
6. The student **can work with scientific explanations and theories**.
7. The student is **able to connect and relate knowledge across various scales, concepts and representations in and across domains**.
**Evolution**
The process of evolution drives the diversity and unity of life.

**Cellular Processes: Energy and Communication**
Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.

**Genetics and Information Transfer**
Living systems store, retrieve, transmit, and respond to information essential to life processes.

**Interactions**
Biological systems interact, and these systems and their interactions possess complex properties.
Why should students choose Biotechnology?

- Hands on
- Real life lab experience
- Learn how to use micropipette, gel electrophoresis, PCR
- Curriculum is derived from biotech labs like The Hutch, ISB and AGC
- Helps you prepare for future
- Ahead of peers in job shadow and internship experience (helps at interviews and at college)
- Internships and work site field trips
Additional Opportunities:

- Internships (both unpaid and paid)
- College Credit
- Industry and college campus tours
- Classroom visits and Skype Sessions with practicing engineers
- Summer camps and opportunities
Biotechnology - HS 1.0 science + 1.0 CTE + 5 college credits (opt)

Anatomy & Physiology HS 1.0 science + 1.0 CTE + 5 college cr (opt)

AP Biology - college credit through AP test

AP Chemistry - college credit through AP test

AP Physics - college credit through AP test
Aerospace Engineering Pathway
## STEM Diploma

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<tr>
<th>Grade</th>
<th>Courses</th>
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<td>- Geometry</td>
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<td></td>
<td>- Chemistry</td>
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<td></td>
<td>- Intro to Engineering Design</td>
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<tr>
<td>11th Grade</td>
<td>- Algebra 2</td>
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<tr>
<td></td>
<td>- Principles of Engineering (CHS)</td>
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<tr>
<td></td>
<td>- Aerospace Engineering</td>
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<tr>
<td>12th Grade</td>
<td>- Pre-Calculus</td>
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<td></td>
<td>- English 12 STEM</td>
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<tr>
<td></td>
<td>- Physics</td>
</tr>
</tbody>
</table>
Honors STEM Diploma

- **9th Grade**
  - Honors Geometry
  - Honors Biology
  - Intro to Engineering Design

- **10th Grade**
  - Honors Algebra 2
  - Chemistry
  - Principles of Engineering (CHS)

- **11th Grade**
  - Honors Pre-Calculus
  - Aerospace Engineering

- **12th Grade**
  - AP Calculus
  - English 12 STEM
  - AP Physics or AP Chem
Principles of Engineering

Topics:

- Forces and Simple Machines
- Energy and Circuits
- Vectors and Statics
- Properties of Materials and Stress/Strain Curves
- Control Systems/Coding
- Hydraulics/pneumatics
- Kinematics
- Statistics
Projects:

- Compound Machine
- Las Vegas Marquee (Circuits/LEDs)
- Projectile Motion Machine
- Truss Bridge
- Arcade Machine and Marble Sorter
Principles of Engineering

- Must pass POE and IED for credit
- 5 credits of CAD
- Transferable to any in-state 4 yr school as ENGR& 114
- Registration is in the spring during POE
Aerospace Engineering

Topics:

- Physics of Flight
- Flight Navigation
- Orbital Mechanics
- Designing and Analyzing Structures
- CAD
- Programming and Robotics
Aerospace Engineering

Projects:

- Balsa Gliders
- Airfoil Design and Wind Tunnel Testing
- RC Airplanes
- Airframe testing
- Composite testing
- Composite Rockets
- Robotic satellite and rover

\[ L = \frac{(C_L A\rho v^2)}{2} \quad \text{and} \quad D = \frac{(C_d A\rho v^2)}{2} \]
Washington Aerospace Scholars

- Partnership between UW, NASA and the Museum of Flight
- Chance to get more college credit taking extra class work online
  - Juniors can get 5 credits of Natural Science (ESS 102) from UW
- Students can get a summer residency at the Museum of Flight
- Students can get summer internships at Boeing
- Available to sophomores and juniors
English 12 STEM
Curricular Highlights:
● Writing, Reading, Speaking and Listening
● Emphasis on Technical Writing
● District designed and approved Honors level course
● Student chosen engineering/research project
● Full Technical/Engineering Report
● Compete at advanced Science and Engineering Fairs presenting to professional scientists and engineers
English 12 STEM

Capstone Project
National STEM Recognition

National Recognition for our students

2 AP Courses and 1 PLTW Course

OR

2 PLTW Courses and 1 AP Course
College Credit in High School

- 7 AP course options - college credits can be earned through high end of course exam performance.
- CHS course options - college credit can be earned by passing the class.
- These courses mirror college freshman curriculum. Students state that these courses truly prepare them for the rigorous academics faced in college courses.
STEM Community Building
- Movie Nights
- Quarterly Game Nights
- Other Social Events
- Club Competitions
- Mentoring opportunities at Edmonds Elementary Schools

Students enjoy being together... after school the department is typically busy!

STEM Parent Group - STEMHAWKS.com
# STEM Program Timeline

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>January 31st</td>
<td>Online STEM Program Applications Due</td>
</tr>
<tr>
<td>End of Feb.</td>
<td>All 8th Grade Registration Forms Due</td>
</tr>
<tr>
<td>April 27th</td>
<td>ESD STEM Expo (@ MTHS 6-8pm)</td>
</tr>
</tbody>
</table>

- **February 10th**
  - Notes of admittance to the STEM Program mailed out
- **March 14th**
  - Central Sound Regional Science and Engineering Fair @ Bellevue Community College

- Late applications to the STEM program will be given consideration
- In-area students: Normal registration process in February; sign up for “IED” and indicate participation in the MTHS STEM program on your form.
- STEM Program Application forms are required from all interested 8th grade students... both in-area and out-of-area students.
STEM Program Application

Link to the Online Application:

https://tinyurl.com/STEMreg20

Registration open NOW!

Due by January 31st for all applicants.

Link is on the MTHS Website.

Late applicants will be given consideration.
First, click here.

Then, Click here.
Section 3: Visit Labs
Visit Labs

- First of all, thank you for coming tonight!
- Find your students down in the HUB, join them.
- Teachers, STEM Students, and clubs will be available for questions in the Labs. Tour maps are included in your packet.