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Aspire Lionel Wilson College Preparatory Academy - Engineering Pathway Program of Study

Focus Area: Engineering for Social Change

Partners: [First Lego League](#), [Engineer Alliance for the Arts](#), [California Academy of Science - Earthquakes](#), [Alameda County Science and Engineering Fair](#), [Code.org](#), [Oakland Chamber of Commerce](#), [Oakland Museum of California](#), [City of Oakland Planning and Zoning Commission](#), UC Berkeley Lawrence Hall of Science, Bay Area Maker Faire

Pathway Vision	<p>What is the instructional vision and desired experience for students that will drive the pathway?</p> <p>All scholars will demonstrate that they can achieve academic and CTE excellence by showing that they are prepared to succeed in the rigorous and high-paying field of engineering. At the same time, scholars will deeply understand the social implications of their work and use the engineering skills they develop to give back to their community and become transformational agents of change. As graduates determine their personal path after high school, they will draw on meaningful work based learning experiences to guide and motivate their path to and through college. Scholars will use the skills and habits of mind they learn as part of the engineering pathway to become more effective in whatever career they choose.</p>				
Pathway COP Meeting Time: 2x/ month	9th Grade Program Grade level meeting time:	10th Grade Program Grade level meeting time:	11th Grade Program Grade level meeting time:	12th Grade Program Grade level meeting time:	Graduate Pathway Outcomes (Student Learning Outcome = graduate requirements)
Academic Core	English 9 Spanish 1 or 2 Biology Algebra	English 10 World History Physics Geometry	English 11 US History Chemistry Algebra 2	English 12/ERWC Government/Economics Statistics or AP Calculus College Readiness AP Biology	All scholars are accepted to and prepared to succeed at a four-year university as well as prepared to succeed in careers beyond college.
Pathway Core Classes	<u>Introduction to Engineering for Social Change (full year)</u>	<u>Principles of Structural Engineering (full year)</u>	<u>Principles of Software Engineering (full year)</u>	<u>Principles of Civil and Environmental Engineering (full year)</u>	All scholars have a well-thought out and meaningful plan for their education and career path after high school that has been informed by their pathway experiences in high school. (Created throughout their senior year in collaboration with their mentor and presented and defended in their senior portfolio).
Pathway Grade Level Theme	<u>Health and Human-Centered Design Engineering</u>	<u>Transportation Systems Design Engineering</u>	<u>Human Impacts and Software Engineering</u>	<u>Habitat Engineering</u>	All scholars are prepared to be resilient agents of change in their communities.
Dual Enrollment CoA On-Site Electives	n/a	n/a	Computer information Systems Communication Studies Sociology	Public Speaking Argumentation Human Values/Ethics	All scholars are prepared to be resilient agents of change in their communities.
Integrated Projects/ Common Performance Assessments NGSS Alignment	<u>Health Solutions Through Robotics</u> Design, build, and refine actions of a software-mediated device that transforms one form of energy into	<u>Designing Safer and More Efficient Transportation Infrastructure</u> Design, build and test a structure designed to facilitate	<u>Human Impact Solutions</u> Plan, prepare, and interpret drawings and models for an engineering solution through	<u>Tiny House Design and Engineering</u> Understand the significance of sustainable building design practices that incorporate	All scholars are prepared to be resilient agents of change in their communities.

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<p>CTE Alignment</p>	<p>another to accomplish a health and wellness related task</p> <p><u>Cross-Curricular Integration</u> English 9 - Complete a research paper that analyses a perspective or argues a point about the potential impact of a proposed health/wellness engineering solution.</p> <p>Biology -Using concepts of biological engineering, create a presentation to address the "Grand Challenges for Engineering" identified by the National Science Foundation.</p> <p>Algebra - Explore that foundations of Algebra as the basis for mathematical analysis in Engineering. Create mathematical models that represent constraints and considerations in engineering</p> <p><u>Standards</u> NGSS HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.</p> <p>CTE 1 - Apply appropriate technical skills and academic knowledge</p>	<p>transportation. Structures includes bridges, tunnels, and roadways.</p> <p><u>Cross-Curricular Integration</u> English 10 - Create analysis of case studies of various infrastructure projects. Course will cover six case studies and will provide students with opportunities to enhance skills such as oral and written communication and project management.</p> <p>Geometry - Study geometric designs in architecture to determine necessary/appropriate load bearing ability for different architectural challenges</p> <p>Physics - Investigate impact of forces on various structural designs</p> <p><u>Standards</u> NGSS HS-PS2-6 Communicate scientific and technical information about why the molecular level structure is important in the functioning of designed materials.</p> <p>CTE 9 - Work productively in teams while integrating cultural and global competence</p>	<p>computer aided design (CAD) techniques.</p> <p><u>Cross-Curricular Integration</u> English 11- Create a technical writing piece that applies writing strategies in the context of software engineering. The focus is on the basic problem-solving activities that underlie effective writing, many of which are similar to those underlying software development.</p> <p>History - Complete a research paper that analyses community and demographic needs and services in various historical periods to inform and contextualize proposed approaches and applications of software engineering</p> <p>Algebra II - Using software and hardware technologies, create a presentation that uses piecewise functions to analyse the cost-effectiveness of selected community services</p> <p>Chemistry - Create a map of Oakland that highlights and annotates relevant chemistry of selected local environmental issues.</p>	<p>beneficial energy and environmental design policies.</p> <p><u>Cross-Curricular Integration</u> English 12</p> <p>Government - Complete a research paper on city planning decisions in Oakland and how these decisions have impacted marginalized members of the community.</p> <p>Statistics - Complete a statistical analysis of Oakland census data over a specified period to identify patterns and draw conclusions relevant to student identified issues.</p> <p>AP Calculus - Create a multimedia presentation that explores an application where engineers directly use calculus in their daily practice or use computer programs based on calculus that simplify engineering design.</p> <p>AP Biology - Create a solution to a genetic challenge using CRISPR and recombinant DNA and genetic engineering principles.</p>	
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	<p>5 - Utilize critical thinking to make sense of problems and persevere in solving them</p> <p>C10.0 Understand the methods of applying text to a drawing</p> <p>C10.4 Plan, prepare, and interpret drawings and models through traditional drawing or computer-aided design (CAD) techniques</p>	<p>10 - demonstrate creativity and innovation</p> <p>A6.0 Understand methods used to analyze simple structures</p> <p>A7.0 Understand the properties of structural materials</p> <p>A6.3 Interpret structural design considerations, including load bearing relationships of shear walls, columns, and beams</p> <p>A7.1 Understand the integration of architectural factors such as soil mechanics, foundation design, engineering materials, and structure design.</p>	<p><u>Standards</u></p> <p>NGSS</p> <p>HS-ETS1-2</p> <p>Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p> <p>HS-ESS3-4</p> <p>Evaluate or refine a technological solution that reduces impact of human activities on natural systems.</p> <p>CTE</p> <p>4. Apply technology to enhance productivity</p> <p>C9.0 Understand the tolerance relationships between mating parts</p> <p>C9.3 Use tolerancing in an engineering drawing</p>	<p><u>Standards</u></p> <p>NGSS</p> <p>HS-LS2-7</p> <p>Design, Evaluate, and refine a solution for reducing impacts of human activities on the environment and biodiversity</p> <p>CTE</p> <p>2 - Communicate clearly, effectively, and with reason</p> <p>A2.0 Compare theoretical, practical, and contextual issues that influence design</p> <p>A2.1 Describe the influence of community context and zoning requirements on architectural design</p> <p>A2.2 Understand the ways in which sociocultural conditions and issues influence architectural design</p> <p>A2.3 Compare theoretical and practical effects of human and physical factors on the development of architectural designs</p>	
<p>Defenses or Capstones</p>	<p>Each student presents their integrated project to a panel of students, staff, and community members as part of the end of year Exhibition presentation.</p>	<p>Each student presents their integrated project to a panel of students, staff, and community members as part of the end of year Exhibition presentation.</p>	<p>Junior Portfolio Presentation</p> <p>-present about learnings and experience from internship</p> <p>Industry panel for capstone presentations</p>	<p>Senior Portfolio Presentation</p> <p>-Identify social/community challenge and design an engineering solution</p> <p>-create the solution</p>	

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				-career and college path presentation based on design work Industry panel for capstone presentations	
Other Courses / Electives	n/a	n/a	AP Biology Ethnic Studies	AP Calculus AP Biology Ethnic Studies	
Other Student Experiences (post-session, intersession, rituals, class trips, assemblies)	First Lego League The Collaborative Haptics & Robotics in Medicine (CHARM) Lab	Engineer Alliance for the Arts California Academy of Science - Earthquakes Division	Alameda County Science and Engineering Fair Code.org	Alameda County Science and Engineering Fair Oakland Chamber of Commerce Oakland Museum of California City of Oakland Planning and Zoning Commission	
Work Based Learning	Brown Bag Lunch Events - Guest Speaker Exposure Guest Speakers: Community service providers: firefighter paramedic police officer forensic investigator College Real Talks event including industry speakers	Career Exploration Visits BART Offices Great America Roller Coaster Design Department Construction Site Oakland Airport Earthquake Simulator Laboratory College Real Talks event including industry speakers	Semester-long Engineering Externship (extended job shadow) College Real Talks event including industry speakers	Semester-long College and Career Related Internship College Real Talks event including industry speakers	
College Exposure	Grade Level Partner SF State -Engineering Department -Health Equity Institute	Grade Level Partner UC Berkeley -Engineering Department -Lawrence Hall of Science	Grade Level Partner Stanford University	Grade Level Partner Laney -Construction Management -Architecture	

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	College trip to Stanford College Real Talks event including speakers from UCs, CSUs, CCs, private universities, and technical programs	College trip to UC Santa Cruz College Real Talks event including speakers from UCs, CSUs, CCs, private universities, and technical programs	-Computer Science Engineering Department College trip to UC Davis College Real Talks event including speakers from UCs, CSUs, CCs, private universities, and technical programs	-Engineering College trips to Laney College & choice schools College Real Talks event including speakers from UCs, CSUs, CCs, private universities, and technical programs	
Personalized Supports	Out of class and embedded EL and SPED supports. Small group literacy intervention; small group and individualized supports based on RTI model. Multi-year advisory model with student led conferences creating support plans with families. Pathway course includes initial career and college planning.	Out of class and embedded EL and SPED supports. Small group literacy intervention; small group and individualized supports based on RTI model. Multi-year advisory model with student led conferences creating support plans with families	iMentor mentoring from industry partners for all 11th graders Out of class and embedded EL and SPED supports. Small group literacy intervention; small group and individualized supports based on RTI model. Multi-year advisory model with student led conferences creating support plans with families	iMentor mentoring from industry partners for all 12th graders One-on-one career planning mentoring by school staff as part of the senior portfolio Out of class and embedded EL and SPED supports. Small group literacy intervention; small group and individualized supports based on RTI model. Multi-year advisory model with student led conferences creating support plans with families	
Summer & Expanded Learning Time	Stanford SMASH Courses - rigorous engineering, math and science enrichment Academic Talent Development Program Courses - UC Berkeley: Minds, Brains and Computers Introduction to Biotechnology	Stanford SMASH Courses - rigorous engineering, math and science enrichment Academic Talent Development Program Courses - UC Berkeley: Architectural Design Peralta College District Courses- 3-D Visual Design	Stanford SMASH Courses - rigorous engineering, math and science enrichment Academic Talent Development Program Courses - UC Berkeley: Web Development Elements of Web Design	n/a	

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		Architectural Drafting and Design Introduction to Computer Information Systems	Peralta College District Courses- Introduction to Social and Cultural Anthropology Introduction to Systems Analysis and Design Human Values/Ethics Structure and Interpretation of Computer Programs		
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