Program Name	Engineering Sciences
Program CIP Code	15.0000.00
Program Description and Coherent Sequence	The **Engineering Sciences** program is designed to develop student's understanding of engineering problem solving and design practices. The program will prepare students to apply fundamental scientific and mathematical laws and principles relevant to engineering and technology. Students will learn to apply Science Technology Engineering Math (STEM) concepts to current technologies and tools as they learn about the different disciplines and opportunities within the fields of engineering. The program is designed and delivered as a coherent sequence of experiences using technical instruction, academic foundations, experiential learning, and supervised occupational experience to enhance their skills through good communication, teamwork, leadership and personal development skills through the program and their Career and Technical Student Organization: SkillsUSA. **Fundamentals of Engineering Sciences:** This course will teach the basic knowledge of Engineering principles and systems such as the engineering design process, system analysis and control, focusing on the application of mathematical laws and principals. This course may be waived if the student has completed or currently enrolled in Algebra II or above. Algebra II is not a CTE course and does not qualify for funding. **Applications of Problem Solving in Engineering Sciences:** This course provides an opportunity for students to apply fundamentals in the world of new technologies emerging from engineering research such as nanotechnology, chemical, environmental or mechanical engineering. This includes the use of hand and machine tools, computer aided tools and measurement systems. Students will learn how to link theory to hands-on real-world applications. **Advanced Engineering Sciences:** This course prepares students to use critical thinking skills and apply formulations from pre-calculus to basic innovative engineering job functions of research, design, development, testing and analysis when preparing product. Students will apply concepts of math and science, and problem solving skills to the different systems using input, process, output and feedback. Students will further demonstrate the fundamentals of engineering and mechanics using scientific principles from materials to construct a project with consideration to environmental factors, economics and safety. This course is modeled to university criterion covering engineering theory through a hands-on approach.

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	Work-based Learning: Students have the opportunity to participate in either an Engineering Sciences Cooperative Education experience or an Internship.
Industry Validated Standards	http://www.azed.gov/career-technical-education/files/2016/08/engineering-sciences-15000000.pdf
Specialized Equipment	Engineer scale Coordinate Measuring Machine (CMM) Microscope Oscilloscope Spectrophotometer Stress Analyzer Tensile/Compression Tester Ultrasonic Tester Dremel tools Exacto-knives and blades Hex key wrenches Layout Bluing fluid Magnifying glass Masses (set) or weights (one set per every 4 or 5 students) Multimeter (volts, amps, ohms) Photo gates (assortment) Protractors Soldering iron, solder Spring scales (from .5 NT up to 50 NT) Stopwatch Soldering iron, solder Weigh scale Programmable Logic Controller (PLC) Robotic Arm on Slide Base SPC Miniprocessor Equipment list can be accessed at: http://www.azed.gov/career-technical-education/files/2013/07/equipment-list-engineering-sciences-15000000.pdf
Industry Recognized Certifications	• Manufacturing Skill Standards Council (MSSC) - o Certified Production Tech (CPT) • NICET - National Institute for Certification in Engineering Technologies o ISCET - International Society of Certified Technicians CET 75% • American Society for Quality Training (ASQ) o ASQ scale score 550 • Manufacturing Skills Standards Council (MSSC) o CLA certified logistics 76% o CLT certified logistics tech 78%

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	o MSSC green 78% o MSSC Quality 75% o MSSC Production 74% o MSSC safety 76% • Environmental Systems Research Institute o Geographic Information Systems Technician (GIS) • Robotics Education and Certification Foundation (REC) o REC Foundation Pre-Engineering Certification • SolidWorks CSWA 70% • Autodesk Certified User-Inventor •
CTE End-Of- Program (EOP) Technical Skill Assessment (TSA) Y/N	Y
Current EOP TSA Pass Score	60%
Participation in JTED Program Qualifies Students for These Employment Opportunities	• Facilities engineering technician • Quality auditor • Engineering field technician •

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SB1525 JTED Course and Program Requirements

Requires students obtain passing score of 60% on assessment 15-391(3)(b) Page 1/20-24 & 15-391(5)(b) Page 2/1-6	Yes Engineering Sciences Technical Skill Assessment requires a 60% pass rate. ASQ scale score 550 CLA certified logistics 76% CLT certified logistics tech 78% GIS 75% MSSC Green 78% MSSC Quality 75% MSSC Production 74% MSSC Safety 76% NICET 500 is the passing score Solid works CSWA 70%
Not a Course Required under Minimum Course of Study including Honors 15-391(3)(d) Page 1/27-29	Courses in this program are not required for graduation. However, students who have taken or are enrolled in Algebra II or higher math may choose to skip the 1st Engineering Sciences course (.10 course) and still be considered to have completed the program. The math course that is used in lieu of the .10 Engineering Sciences course is not a CTE Perkins, Priority or JTED funded course—it just allows the student to waive the entry level course.
Majority of Instructional Time in Lab / Field / Work Based Learning Environment 15-391(3)(e) Page 1/30-32 and **Requires CTSO Participation** 15-391(5)(d) Page 2/10-13	Yes. Engineering Sciences is a lab-based program. The majority of the instruction is accomplished in a lab environment or in a work-based setting. SkillsUSA
Demonstrated Need for Extra Funding for a course 15-391(3)(f) Page 1/33-34	Yes. Engineering requires extra equipment for experiments and projects. There is also need for special equipment to run prototypes and equipment for analysis purposes.
Specialized Equipment Exceeds Cost of Standard Course 15-391(3)(g) Page 1/35-36 and 15-391(5)(c) Page 2/7-9	Yes. Specialized equipment includes but not limited to: Engineer scale Coordinate Measuring Machine (CMM) Microscope Oscilloscope Spectrophotometer Stress Analyzer Tensile/Compression Tester Ultrasonic Tester Dremel tools

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	Exacto-knives and blades Hex key wrenches Layout Bluing fluid Magnifying glass Masses (set) or weights (one set per every 4 or 5 students) Multimeter (volts, amps, ohms) Photo gates (assortment) Protractors Soldering iron, solder Spring scales (from .5 NT up to 50 NT) Stopwatch Soldering iron, solder Weigh scale Programmable Logic Controller (PLC) Robotic Arm on Slide Base SPC Miniprocessor Equipment list can be accessed at: http://www.azed.gov/career-technical-education/files/2013/07/equipment-list-engineering-sciences-15000000.pdf
Alignment through Curriculum, Instructional Model and Courses Sequence 15-391(5)(e) Page 2/15-18	Yes. State-established course sequence for Engineering Science Program Consists of 3 Carnegie Units of Instruction.
Defined Pathway to Career and Postsecondary Ed in Specific Vocation or Industry 15-391(5)(f) Page 2/19-21	Yes. Programs must offer one or more of the following: • Manufacturing Skill Standards Council (MSSC) - o Certified Production Tech (CPT) • NICET - National Institute for Certification in Engineering Technologies o ISCET - International Society of Certified Technicians CET 75% • American Society for Quality Training (ASQ) o ASQ scale score 550 • Manufacturing Skills Standards Council (MSSC) o CLA certified logistics 76% o CLT certified logistics tech 78% o MSSC green 78% o MSSC Quality 75% o MSSC Production 74% o MSSC safety 76% • Environmental Systems Research Institute o Geographic Information Systems Technician (GIS) • Robotics Education and Certification Foundation (REC) o REC Foundation Pre-Engineering Certification • SolidWorks CSWA 70% • Autodesk Certified User-Inventor Students may attain one or more of the above industry

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	certifications. In addition, programs offer dual enrollment with either the local community college or University of Arizona.
Fills High Need Vocation or Industry as Determined by CTE/ADE 15-391(5)(j) Page 2/30-31	Yes. Arizona Jobs: Engineering, Currently more than 4,000 open positions: http://www.engineerjobs.com/jobs/arizona/ The Perry Initiative: http://perryinitiative.org/ Freeport Mining Initiatives: http://www.freeportinmycommunity.com/schools/stem-grant UA Stem Learning Center Thinks Forward: http://www.arizona.edu/ua-stem-learning-center-thinks-forward
Requires a Single or Stackable Credential or a Skill that allows a student to obtain work 15-391(5)(k) Page 2/32-35	Yes, the program has identified credentials: • Manufacturing Skill Standards Council (MSSC) - o Certified Production Tech (CPT) • NICET - National Institute for Certification in Engineering Technologies o ISCET - International Society of Certified Technicians CET 75% • American Society for Quality Training (ASQ) o ASQ scale score 550 • Manufacturing Skills Standards Council (MSSC) o CLA certified logistics 76% o CLT certified logistics tech 78% o MSSC green 78% o MSSC Quality 75% o MSSC Production 74% o MSSC safety 76% • Environmental Systems Research Institute o Geographic Information Systems Technician (GIS) • Robotics Education and Certification Foundation (REC) o REC Foundation Pre-Engineering Certification • SolidWorks CSWA 70% • Autodesk Certified User-Inventor
Leads to certification or licensure verified by that vocation or industry that qualifies student for employment which the student would not otherwise qualify. 15-391(5)(l) Page 2/36-39	Yes, programs must offer one or more of the following: • Manufacturing Skill Standards Council (MSSC) - o Certified Production Tech (CPT) • NICET - National Institute for Certification in Engineering Technologies o ISCET - International Society of Certified Technicians CET 75% • American Society for Quality Training (ASQ) o ASQ scale score 550 • Manufacturing Skills Standards Council (MSSC)

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	o CLA certified logistics 76% o CLT certified logistics tech 78% o MSSC green 78% o MSSC Quality 75% o MSSC Production 74% o MSSC safety 76% • Environmental Systems Research Institute o Geographic Information Systems Technician (GIS) • Robotics Education and Certification Foundation (REC) o REC Foundation Pre-Engineering Certification • SolidWorks CSWA 70% • Autodesk Certified User-Inventor
If no certification or licensure is accepted by vocation or industry, completion of program must qualify student for employment for which student would not otherwise qualify without completing JTED program. 15-391(5)(l) Page 2/39-43	Certifications are available.
Requires instruction and instructional materials substantially different from and exceed scope of standard instruction and include skills, competencies and knowledge to be successful in JTED program vocation or industry. 15-391(5)(m) Page 2/44-45 and 3/1-3	Yes. • PLTW (project lead the way), • Engineering by design • MSF national Science Foundation engineering, engineer your world • NAE national academy of engineering • STEM academy Above are appropriate instructional materials and they all exceed the scope of standard instruction.
Industry provided financial or technical support. 15-391(5)(n) Page 3/4-8	Yes Engineering business and industries support of Engineering Sciences programs include but not limited to: • Engineering professionals serve on Engineering Sciences Technical Skill Standards Development and Validation Committees • Engineering professionals serve on state and local Advisor Boards. • Provide professional development for teachers. • Provide work-based learning experiences for students • Provide industry education grants e.g NASA, FMI,Grant for programs http://www.freeportinmycommunity.com/schools/stem-grant • Promote “non-traditional” career options such as Women in engineering group http://wise.web.arizona.edu/ http://outreach.engineering.asu.edu/azfll/2015/10/15/freeport-mcmoran-copper-gold-foundation/

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Demonstrated need for extra funding in order to provide JTED program 15-391(5)(o) Page 3/9-11	Yes. The cost of high tech equipment and projects that is highly suggested by industry advisors is necessary to emulate real world situations.

Eligibility		**Yes**	**No**
JTED	The **Engineering Sciences** program meets the requirements for **JTED** compliance and eligibility	x	
CTE Federal Perkins and State Priority	The **Engineering Sciences** program meets the requirements for **Perkins** and is eligible to generate **CTE State Priority funding**.	x	

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