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A Proposal for Expansion of STEM Program Courses in Ferris ISD

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Background

In the 2015/2016 school year, a proposal was submitted for consideration for the implementation of STEM courses at Ferris High School. The proposal outlined the deployment of courses over a 5-year period.

The STEM courses launched at Ferris High School in August 2016 consisted of the following:

- Principles of Technology (1 section - 26 students)
- Computer Science I (1 section - 15 students)
- Robotics & Automation (1 section - 18 students)

Current Assessment & Observations

In addition to the courses that were launched in August 2016, a competitive team was established to participate in the FIRST Robotics environment in the FIRST Tech Challenge program. A total of 28 students participate on the competition robotics team. Of these 28 students, only 7 are enrolled in the Robotics & Automation course. The course description will be modified to include a requirement for participants in the course to participate on the competition team.

The Computer Science I course provides a language other than English (LOTE) credit but was not offered as an Advanced Placement course for the 2016/2017 school year. This decision was made to allow for the further development of participation in the UIL Computer Science contest. The AP Computer Science Principles course does not facilitate mastery of the JAVA programming language and this would have directly impacted the ability of Ferris High School to compete in the UIL Computer Science contest.

The Principles of Technology course has proven to not be a good fit as a fundamental/gateway STEM course. This course could be a good alternative for the Science Department to consider as either a lower-level Physics course or a possible replacement for IPC.

Proposed Course Name Changes

To facilitate proper funding coding and course credits, some of the course names from the 2016/2017 proposal will be modified for the 2017/2018 proposal update.

2016/2017 Proposal

Computer Programming I	-	-	-
Computer Programming II	-	-	-

2017/2018 Proposal Update

AP Computer Science I
AP Computer Science II

Proposed Course Descriptions

Engineering Design & Problem Solving (1 Credit)

- Pre-Requisites:** None
- Allowed Concurrent:** None
- Suggested Grade:** 9
- Allowed Grades:** 9, 10, 11, & 12

Developed by a team of University of Texas faculty and NASA engineers, this course engages students in authentic engineering practices in a project-based environment. Students complete a series of socially relevant design challenges to develop engineering design skills and habits of mind.

AP Computer Science I (1 Credit)

- Pre-Requisites:** None
- Allowed Concurrent:** None
- Suggested Grade:** 9
- Allowed Grades:** 9, 10, 11, & 12

This course introduces students to the logic of visualizing real-world problems as mathematical problems. Students will learn to work in both visual block and text-based programming environments with languages such as Processing and Python. This course counts as a Language Other Than English credit. Students in this course will take the Advanced Placement Computer Science - Principles exam at the conclusion of the school year. This course is based upon the curriculum of the Thriving in our Digital World course from the University of Texas at Austin.

AP Computer Science II (1 Credit)

- Pre-Requisites:** AP Computer Science I
- Allowed Concurrent:** Robotics I
- Suggested Grade:** 10
- Allowed Grades:** 10, 11, & 12

This course continues an in-depth study into visualizing real-world problems as mathematical problems. Students will solely work with text-based programming environments and object-oriented languages such as JAVA, Python, and Ruby. This course counts as a Language Other Than English credit. Students in this course will take the Advanced Placement Computer Science - A exam at the conclusion of the school year.

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Computer Science III (1 Credit)

Pre-Requisites: AP Computer Science II

Allowed Concurrent: Robotics II

Suggested Grade: 12

Allowed Grades: 11 & 12

This course concludes an in-depth study into visualizing real-world problems as mathematical problems. Students will work on projects involving mobile application development in the Android and iOS operating environments. This course counts as a Language Other Than English credit..

Robotics I (1 Credit)

Pre-Requisites: AP Computer Science I, Engineering Design & Problem Solving

Allowed Concurrent: None

Suggested Grade: 10

Allowed Grades: 10, 11, & 12

This course introduces students to the field of robotics design and automation programming of small-scale systems. The course is framed within the FIRST Tech Challenge (FTC) program. Students enrolled in this course are required to participate on the FIRST Tech Challenge (FTC) robotics team associated with this class.

Robotics II (1 Credit)

Pre-Requisites: Robotics I

Allowed Concurrent: AP Computer Science II

Suggested Grade: 11

Allowed Grades: 11 & 12

This course introduces students to the field of robotics design and automation programming of mid-scale systems. The course is framed within either the FIRST Tech Challenge (FTC) or FIRST Robotics Competition (FRC) program. Students enrolled in this course are required to participate on the FIRST Tech Challenge (FTC) or FIRST Robotics Competition (FRC) robotics team associated with this class.

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Roll-Out

This program would be phased-in over the course of the next several years as follows:

2017/2018

- Engineering Design & Problem Solving - Open to all qualified students
- AP Computer Science I - Open to all qualified students
- AP Computer Science II - Open to all 16/17 CS I students
- Robotics I - Open to all all qualified students
- Robotics II - Open to all 16/17 Robotics & Automation students

2018/2019

- Engineering Design & Problem Solving - Open to all qualified students
- AP Computer Science I - Open to all qualified students
- AP Computer Science II - Open to all qualified students
- Computer Science III - Open to all qualified students
- Robotics I - Open to all qualified students
- Robotics II - Open to all qualified students

9th Grade	10th Grade	11th Grade	12th Grade
Engineering Design & Problem Solving			
Advanced Placement Computer Science I			
	Advanced Placement Computer Science II		
	Robotics I		
		Robotics II	
			Computer Science III

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HB5 STEM Endorsement

Assuming a student completes the requisite courses outlined by the provisions of HB5, this proposal will provide an endorsement in Science, Technology, Engineering, & Mathematics (STEM) starting in the 2018/2019 school year.

Science: Biology, Chemistry, & Physics, + 2 Additional Sciences

Additional Sciences include:

- AP Physics
- Principles of Technology
- Anatomy and Physiology
- Engineering Design & Problem Solving

Technology: AP Computer Science I, AP Computer Science II, Computer Science III

Engineering: Robotics I

Mathematics: Algebra I, Algebra II, & Geometry, + 2 Post-Algebra II Maths

Additional Maths include:

- Precalculus
- AP Calculus
- AQR
- AP Computer Science I

Future STEM Courses

Potential courses from the STEM pathway that could be added include (but are not limited to):

- Principles of Applied Engineering
- Digital Electronics
- Practicum in Science, Technology, Engineering, and Mathematics
- Discrete Mathematics for Computer Science (additional math course)
- Engineering Mathematics (additional math course)