

On November 29, 2007, the Board of Education approved the criteria to establish a Governor's Career and Technical Academy. Subsequently, on March 19, 2008, the Board approved the standards for the Governor's Career and Technical Education Exemplary Standards Awards Program, in which all Career and Technical Academies must participate.

Currently there are seven Governor's Career and Technical Academies in Virginia. They are located in Arlington County, Halifax County, Loudoun County, The New Horizons Regional Center in Hampton City, the Pruden Center for Industry and Technology in Suffolk City, Russell County and Stafford County.

As required by the Board of Education, the State Council of Higher Education in Virginia (SCHEV) has reviewed the attached proposal and recommends that the Board approve the proposal. Staff at the Virginia Department of Education (DOE) have also reviewed the proposal in the context of the Board's criteria. An executive summary of the proposal is contained in Attachment A. Attachments B and C contain the reports from the reviews by SCHEV and the DOE. Attachment D contains the complete proposal.

Summary of Major Elements:

The proposed program offers students an opportunity to explore engineering and engineering technology fields and concepts within their comprehensive high school education. The unique nature of this program is in keeping with Chesterfield County's Design for Excellence which strives to prepare students for higher education as well as the 21st century workplace. The Governor's Career and Technical Academy for Engineering Studies seeks to foster the creative talent and work force readiness skills to prepare students for the high-wage, high-demand, and high-skilled occupations that will maintain the local and state economic health.

The Governor's Career and Technical Academy for Engineering Studies will expand offerings for high school students in Chesterfield County. Two career pathways, Science and Mathematics and Engineering Technology will expose students to various engineering and engineering technology fields through unique and specialized electives and application of engineering and work force readiness skills in core-academic classes. The program is designed to prepare students for the rigors of higher education while also strengthening work force readiness skills.

Superintendent's Recommendation:

The Superintendent of Public Instruction recommends that the Board of Education waive first review and approve the proposal to establish the Governor's Career and Technical Academy for Engineering Studies.

Impact on Resources:

Funding must be provided at the local level.

Timetable for Further Review/Action:

The Governor's Career and Technical Academy for Engineering Studies will be in operation by the beginning of the 2009-2010 academic year.

**The Governor's Career and Technical Academy for Engineering Studies
Executive Summary
May 28, 2009**

- Partnership Members:** Chesterfield County Public Schools; American Society of Civil Engineers; Austin, Brockenbrough and Associates, L.L.P.; Northrop Grumman; John Tyler Community College; Mazda North American Operations; McDonough, Bolyard and Peck, Inc.; Core Consulting; Bon Secours; and St. Francis Medical Center
- Lead Entity:** Chesterfield County Public Schools
- Fiscal Agent:** Chesterfield County Public Schools
- Contact Person:** Ms. Nancy R. Hoover
Coordinator, Pre-Engineering Specialty Center
804-768-6110
nancy_hoover@ccpsnet.net
- Academy Location:** The Governor's Career and Technical Academy for Engineering Studies
Lloyd C. Bird High School
10301 Courthouse Road
Chesterfield, VA 23832
- Number Students:** Approximately 250 students, grades 9-12, will be enrolled in the Academy for the 2009-2010 school year. Future plans are in place to expand and grow both pathways in the program to ultimately serve 400 students.
- Career Pathways:** Science and Mathematics
Engineering Technology
- Academy Goals and Description:** Chesterfield County's goal is to provide a program of studies that allows students to explore a wide range of engineering and engineering technology fields, while building an understanding of the core skills necessary to enhance students' ability to find success in higher education and the 21st century workplace. The rigorous academic curriculum is centered on lab experiences to better prepare students for a rapidly changing technologically- based field.
- The objectives of the Science and Mathematics career pathway and the Engineering Technology career pathway are to provide:
- Opportunities to take advanced classes in mathematics, science and other core-content courses that will result in college credit while in high school;
 - A constant utilization of integrated computer skills;
 - A basis of practical understanding of engineering through an emphasis on design projects;
 - A detailed overview of expectations in a variety of engineering and engineering technology fields;
 - Opportunities for field experiences to foster a deeper understanding of the

- correlation between class work and the work environment; and
- Information to help students make more informed decisions about their future educational and career plans.

**Highlights
of the
Program:**

Through participation in the Science and Mathematics pathway and the Engineering Technology pathway, students will:

- Graduate earning an advanced diploma, a standard technical diploma or an advanced technical diploma;
- Meet the requirements for the Commonwealth Scholars course of study;
- Gain an understanding of the various fields of engineering and engineering technology;
- Develop an appreciation of the correlations between classroom, laboratory, and field studies;
- Develop workforce readiness skills that greatly enhance written and oral communication skills;
- Experience an opportunity for job shadowing, internships, and/or mentorships;
- Develop a solid basis of problem solving and teamwork skills;
- Receive a unique background that enables students to make a more informed choice about their future goals; and
- Gain an advantage over other students who would be entering the engineering educational tract at the community college or university level and taking engineering courses for the first time.

The State Council of Higher Education for
Virginia

Review of Governor's Career and Technical
Academy Proposal

Name of Lead Entity on Proposal: Lloyd C. Bird High School

Date of Review: April 29, 2009

The State Council of Higher Education for Virginia recommends approval of the Governor's Career and Technical Academy for Engineering Studies as a Governor's Career and Technical Academy.



Dr. Daniel LaVista
Executive Director
State Council for Higher Education

4.30.09

Date

State Council of Higher Education for Virginia

Governor's Career and Technical Academies Postsecondary Curriculum Review Checklist

Academy Name	Collaborating Partners	Total Funds Requested	Allocated Funds for Postsecondary Component
Governor's Career and Technical Academy for Engineering Studies	Lloyd C. Bird High School, UVA, ODU, JTCC & others (see proposal)	-0-	NA

Criteria

Category 1: Postsecondary Accreditation and Approvals

YES/NO

- YES **Postsecondary institution is appropriately accredited**
- NA **Proposed postsecondary program has specialized accreditation, if applicable**
- YES **Proposed postsecondary program is SCHEV and/or VCCS approved**
- NO **Proposed postsecondary program will be seeking SCHEV and /or VCCS approval**

Category 2: Governor's Career and Technical Academy Requirements

YES/NO

- YES **Evidence of a partnership with a postsecondary institution, business, or industry, and demonstrated roles for each entity**
- YES **Offers at least one career pathway in a field identified by a statewide authority or organization as a strategic growth area for Virginia**
- YES **Offers at least one career pathway addressing regional and local work force demand in a high-wage, high skill field identified by employers and work force officials**
- YES **At least one of the two career pathways is in a STEM-related field**

Category 3: Postsecondary/Business Component Requirements

YES/NO

- YES **Provides opportunities for students to earn industry credentials or state licensure, associate or baccalaureate degrees, and college credit for work-based experiences**
- YES **Articulates with baccalaureate programs or to higher levels of training or professional credentialing**
- Demonstrates P-16 integration including curriculum development with high school, college and university faculty (desired)**
- Includes college faculty as adjunct faculty of the Academy (desired)**
- YES **Provides opportunities for students to participate in work-based experiences**

Category 4: Academic Quality

YES/NO

- YES **Requires appropriate postsecondary faculty qualifications**
- YES **Requires faculty to hold industry certification, where necessary**
- YES **Planned professional development for faculty and administrators**
- YES **Planned systematic program and learning outcomes assessment**

Category 5: Administration and Funding

YES/NO

- YES **Funding is sufficient to support effective administrative and operational needs including materials, administrative personnel and facilities**
- YES **Funding is sufficient to sustain faculty salaries, curriculum development costs and instructional materials and delivery**
- YES **Facilities possess the necessary physical attributes to deliver the instructional program (classroom space, technology, labs, equipment)**

COMMENTS

The proposed program is comprehensive and integrated, meeting the criteria outlined by SCHEV. It is well written and has an effective plan for the efficient utilization of resources.

Areas to emphasize when implementing the Academy: 1) ongoing involvement of college faculty in curriculum planning; 2) opportunities to involve college faculty in teaching/and or other student related activities; and 3) strategies to support students who may struggle with the rigor of the program.

This is a well done proposal.

**Virginia Department of Education
Governor's Career and Technical Academy
Proposal Review Checklist**

Final Review

Title of Proposal: The Governor's Career and Technical Academy for Engineering and Engineering Technology Studies

Lead Entity for Proposal: Chesterfield County Public Schools

Date of Review: April 6, 2009

**Virginia Department of Education
Governor's Career and Technical Academy
Proposal Review Checklist**

I. Partnership Capacity

Partnerships desiring to implement a Governor's Career and Technical Academy shall provide the Department of Education with evidence of the following:

Criteria	Documentation			Comments
	Full	Partial	None	
A. An active, ongoing planning committee, including a list of members and signed certifications from each that they are willing and able to serve in that capacity. At a minimum, members must represent K-12 education (superintendent or designee), higher education, and business and industry. All partners must be represented on the committee.	X	X		4/6/09 One signature sheet is missing. 4/15/09 This has been corrected.
B. An advisory committee, including a list of members and signed certifications from each that they are willing and able to serve in that capacity.	X			
C. A written memorandum of agreement among school divisions, local businesses, postsecondary institutions, and any other partners that outlines ways in which community resources will contribute to the Governor's Career and Technical Academy to broaden the scope of students' educational experiences.	X			

Criteria	Documentation			Comments
	Full	Partial	None	
D. A statement of assurances that the Governor's Career and Technical Academy Planning Committee has reviewed provisions of <i>Administrative Procedures Guide for the Establishment of Governor's Career and Technical Academies</i> and agrees to follow the guidelines set forth in the document (see appendix).	X			The assurance statement can be found in Appendix E.
E. A statement of assurances that, if applicable, an ongoing Governing Board will be established to reflect current Board of Education regulations relative to jointly operated schools and programs (see appendix).				Not applicable
Comments:				

II. Need/Rationale for the Academy

Partnerships desiring to implement a Governor's Career and Technical Academy shall provide the Department of Education with evidence of the following:

Criteria	Documentation			Comments
	Full	Partial	None	
A. Demonstration of the need/rationale for the Academy. This statement should be concise and state the major reasons to have a Governor's Career and Technical Academy, including need at the state, local and/or regional levels.	X			Need is stated clearly and concisely.
B. A description of the enhanced or additional offerings in science, technology, engineering, and/or mathematics (STEM) that will meet the need described above.	X			
C. A fiscal agent that is a public entity, including a certification that the entity is willing and able to serve in that capacity.	X			
Comments:				

III. Program Description

Each Governor's Career and Technical Academy planning committee shall develop cooperatively with local school divisions, business, community, and higher education partners and have available for review and dissemination, a program description that includes:

A. A statement of program goals addressing the following criteria:

Criteria	Documentation			Comments
	Full	Partial	None	
1. Rigorous academic content in career and technical instruction;	X			The program of studies is very strong.
2. An emphasis on STEM career pathways;	X			Both pathways are in the STEM career cluster.
3. Individualized high school plans to ensure course selections that are aligned with students' transition and career goals after high school;	X			
4. Evidence that graduates will complete a college and work readiness curriculum, minimally at the level specified for Commonwealth Scholars Course of Study (State Scholars Core) with the possibility of pre-approved substitution of equivalent courses where there may be more relevant course selections for a particular career pathway;	X	X		4/6/09 It is difficult to assess whether the Commonwealth Scholars Course of Study is being met. We request that the plan of study be resubmitted with state course titles and course codes. 4/15/09 The program of studies meets the requirements for the Commonwealth Scholars.
5. Evidence that graduates will qualify for the Technical and/or the Advanced Technical Diplomas; and	X			
6. Incorporation of Virginia's Workplace Readiness Skills.	X			
Comments:				

B. A statement of program objectives and performance measures to:

Criteria	Documentation			Comments
	Full	Partial	None	
1. Improve academic achievement of Academy students;	X			
2. Increase completion of dual enrollment courses;	X			
3. Provide workplace readiness experiences for students through strong partnerships with businesses;	X			
4. Increase high school graduation rates;	X			
5. Reduce dropout rates;	X			
6. Increase enrollment and retention in postsecondary education;	X			
7. Increase the proportion of students completing a college and work place ready curriculum in high school;	X			
8. Reduce the proportion of students requiring remediation in college;	X			
9. Increase the number of industry certifications awarded to high school students; and	X			
10. Increase the number of graduates employed in high-wage, high-demand and high-skill careers.	X			
Comments: Chesterfield plans to follow students for up to five years after high school graduation to collect data the employment and postsecondary criteria.				

C. A brief description of the proposed program, including:

Criteria	Documentation			Comments
	Full	Partial	None	
1. Site location;	X			
2. Number of students to be served;	X			
3. Grade levels;	X			
4. General curriculum design;	X			
5. List of courses to be delivered;	X			
6. Description of how/where the courses will be delivered. Courses may be delivered on a high school, technical center or community college campus, online, or in other innovative ways; and	X			
7. Designation of full-day or part-day, academic-year program.	X			
Comments:				

D. Evidence of participation in the Governor’s Exemplary Standards Award Program for Career and Technical Education

	Documentation			Comments
	Full	Partial	None	
	X			
Comments: Statement of intent is included.				

E. Program and course descriptions

E.1. At least two well-articulated career pathways must be included that meet the following criteria:

Criteria	Documentation			Comments
	Full	Partial	None	
Pathway #1: Engineering and Technology				
a. Must include opportunities to earn industry credentials, postsecondary certificates, diplomas or associate degrees while in high school and pursue additional industry credentials and academic degrees at the associate, bachelor's and graduate levels. These pathways may be in the same or different career clusters.	X			
b. Must be in a field identified by a statewide authority or organization, such as the Virginia Economic Development Partnership or the Virginia Research and Technology Advisory Commission, as a strategic growth area for Virginia. Examples include biosciences, information technology, automotive technology and motor sports, as well as modeling and simulation and nanotechnology or	X			
c. Must address regional and local work force demand in a high-wage, high-skill field as identified by employers and work force officials.				Fulfilled statewide requirement
d. At least one pathway must be in a STEM-related field. This career pathway should drive the innovative capacity of the region and/or state.	X			Both pathways are in the STEM career cluster.
Comments:				

Criteria	Documentation			Comments
	Full	Partial	None	
Pathway #2: Science and Mathematics				
a. Each career pathway must include opportunities to earn industry credentials, postsecondary certificates, diplomas or associate degrees while in high school and pursue additional industry credentials and academic degrees at the associate, bachelor's and graduate levels. These pathways may be in the same or different career clusters.	X			
b. Must be in a field identified by a statewide authority or organization, such as the Virginia Economic Development Partnership or the Virginia Research and Technology Advisory Commission, as a strategic growth area for Virginia. Examples include biosciences, information technology, automotive technology and motor sports, as well as modeling and simulation and nanotechnology, <u>or</u>	X			
c. Must address regional and local work force demand in a high-wage, high-skill field as identified by employers and work force officials.				This pathway addresses a statewide need.
d. Of the two pathways described, at least one must be in a STEM-related field. This career pathway should drive the innovative capacity of the region and/or the state.	X			Both pathways are in the STEM career cluster.
e. Additional career pathways may address one of the areas described above, or an area identified by the partnership as an area of interest, growth, or expansion for students in the service area of the Academy.				Not applicable
Comments: Both pathways provide a solid foundation for future careers in a STEM-related field.				

E.2 List of all requirements for successful program completion.

	Documentation			Comments
	Full	Partial	None	
	X			
Comments:				

E.3 Academy graduates must achieve one or more of the following benchmarks:

Criteria	Documentation			Comments
	Full	Partial	None	
a. Earn one or more industry certifications or state occupational licenses, and/or demonstrate competencies on an assessment instrument recognized by postsecondary institutions such as CLEP examinations, collaboratively designed or mutually approved end-of-course tests, college placement tests, or student portfolios reviewed by a team of college and high school faculty; <u>or</u>	X		X	4/15/09 Opportunities for industry credentials have been added.
b. Earn at least 9 transferable college credits as defined in the Early College Scholars program (includes dual enrollment, AP and other options); <u>or</u>	X			
c. Earn an Associate Degree.			X	
Comments:				

E.4 Significant work-based experience must be included representing additional instruction or training beyond the classroom such as:

Criteria	Documentation			Comments
	Full	Partial	None	
a. Cooperative Education; or	X			
b. Internships; or	X			
c. Job Shadowing; or	X			
d. Mentorships; or	X			
e. Project-based learning; or	X			
f. Service learning; or	X			
g. A combination of the above.				
Comments: This program provides a variety of options for students.				

F. Length of program and daily schedule: Governor's Career and Technical Academies are defined by program content, not by the location or delivery system of courses. Evidence of the following must be submitted:

Criteria	Documentation			Comments
	Full	Partial	None	
Designation of full-day or part-day, academic-year program.	X			
Comments:				

G. Assurance from the fiscal agent that operating funds and facilities are available to support the Governor's Career and Technical Academy and are adequate to meet the needs of the program

	Documentation			Comments
	Full	Partial	None	
	X			
Comments:				

H. Materials and equipment to be provided to accomplish program goals and objectives.

	Documentation			Comments
	Full	Partial	None	
	X			
Comments:				

I. Evidence of an internal evaluation process to effect program improvement, including:

Criteria	Documentation			Comments
	Full	Partial	None	
1. A review of the Academy's policies, procedures, and outcomes;	X			
2. A review of the program design and instructional delivery;	X			
3. Consideration of feedback from students, staff, parents, the community, and partnership members; and	X	X		4/6/09 There is no mechanism for student or parent feedback. 4/15/09 Feedback from these groups will be through an online process.
4. Annual collection and reporting of data to the Department of Education related to student achievement, goal achievement, and other indicators.	X			
Comments:				

IV. Administrative Procedures

Each Governor's Career and Technical Academy must develop and maintain procedures developed cooperatively with participating partners. There should be evidence of procedures in the four areas that follow.

A. Partnerships - The role of business and industry, public school divisions, and postsecondary institutions in the partnership. The role of workforce and economic development entities should also be included if they are among the partners.

	Documentation			Comments
	Full	Partial	None	
	X			
Comments:				

B. Student recruitment, selection criteria, and admissions.

	Documentation			Comments
	Full	Partial	None	
	X			
Comments:				

C. Code of student conduct and attendance.

	Documentation			Comments
	Full	Partial	None	
	X			
Comments:				

D. Transportation provided by the school division or consortium that is in compliance with all applicable federal and state regulations.

	Documentation			Comments
	Full	Partial	None	
	X			
Comments:				

E. Staff recruitment, selection, and assignment - The Governor’s Career and Technical Academy shall hire staff members who meet the Virginia teacher licensure requirements and/or postsecondary faculty qualifications. Where applicable, they must have industry-specific education with training and experience, including industry certification.

	Documentation			Comments
	Full	Partial	None	
	X			
Comments:				

F. Staff development - The program will provide appropriate staff training in addition to staff planning time.

	Documentation			Comments
	Full	Partial	None	
	X			
Comments: The training provided by SREB that links the academic and Career and Technical Education teachers is commendable.				

G. Staff evaluation – Staff will be evaluated according to the human resources policies of the agency or institution employing Academy personnel.

	Documentation			Comments
	Full	Partial	None	
	X			
Comments:				

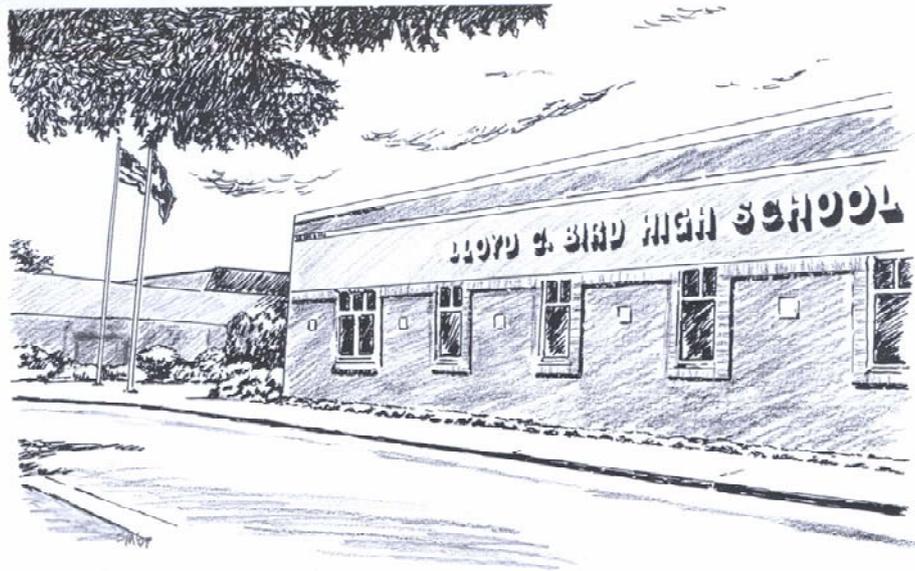
H. Parent, student and community involvement

Criteria	Documentation			Comments
	Full	Partial	None	
1. Preparation for entering the Academies should begin by eighth grade.	X			
2. Students, parents, teachers, and counselors should work collaboratively to:	X			
a. Complete career interest inventories;				
b. Prepare academic and career plans outlining an intended course of study in high school;	X			
c. Review multiple postsecondary pathways and the steps required to pursue them;	X			
d. Participate in career assessments to identify areas students should strengthen to qualify for their selected pathways; and	X			
e. Discuss available diplomas, seals, and other recognitions including admission to specialized programs such as Governor's Academies.	X			

I. Documentation of insurance, budget, and other fiscal information

	Documentation			Comments
	Full	Partial	None	
Insurance	X			
Budget (from appendix)	X			
Budget Narrative	X			
Other				
Comments:				

Lloyd C. Bird High School Chesterfield, Virginia



Proposal to Establish a Governor's Career and Technical Academy for Engineering Studies

Submitted
Spring 2009

Governor’s Career and Technical Academy for Engineering Studies

Virginia Board of Education Proposal

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Introduction

The Pre-Engineering Specialty Center at Lloyd C. Bird High School in Chesterfield County operates as a “school within a school,” giving students an opportunity to explore various engineering fields through specialized classes and apply engineering concepts in core-academic classes. Specialty centers exist in all division high schools, each with a unique emphasis. The Pre-Engineering Specialty Center focuses on preparation and career development in Science, Technology, Engineering and Mathematics (STEM) fields. The unique nature of this program is in keeping with Chesterfield County’s Design for Excellence which strives to prepare students for higher education as well as the 21st Century workplace. The Pre-Engineering Specialty Center seeks to foster the creative talent and workforce readiness skills to prepare students for the high-wage, high-demand, and high-skilled occupations that will maintain the local and state economic health.

The Pre-Engineering Specialty Center currently serves approximately 230 students within the student body of 1,750. Within the Center two career pathways are offered, each rigorous and college preparatory, but with different pathways to graduation and matriculation into either the workforce or higher education. The Science and Mathematics career pathway is a four-year program that focuses on engineering fields and admits students from across the County; students enter as freshmen. The Engineering Technology career pathway is a three-year curriculum that students enter as sophomores that has a focus on the technology associated with engineering fields. Though students from across the County may apply, recruitment priority for the Engineering Technology pathway is within the current Lloyd C. Bird student population. Both pathways emphasize engineering principles and concepts through specialized classes and application of these concepts in core-academic classes. Though there are common elements between the pathways, each offers different opportunities

for students to engage in high-level coursework unique to the chosen pathway with opportunities to earn college credit that leads to greater preparation for higher education or industry certification.

The Science and Mathematics career pathway affords students the opportunity to pursue aerospace engineering, architectural engineering, biomedical engineering, and computer science incorporated into manufacturing engineering. The Engineering Technology career pathway allows students to pursue bio-engineering technology, aerospace engineering technology, architectural/civil engineering technology, and computer electronics technology. There are opportunities for students to cross over between these fields of engineering and engineering technology to maximize their exposure to STEM careers.

Chesterfield County, located in the heart of Virginia and in the Richmond Metropolitan Area, is a prime location for industry and business. Chesterfield County is home to high-profile companies such as Philip Morris and DuPont. It is this close proximity to Virginia's Bio-Tech Research Park and Virginia Commonwealth University that gives students ample opportunities to enter an abundance of STEM fields. This local concentration of STEM businesses and opportunities in STEM fields allows students to see relevant applications of engineering and engineering technology fields in their everyday lives. Chesterfield County is also home to several smaller engineering firms and the current or future site of other industrial companies such as Mazda, Rolls-Royce, and Northrop Grumman. These assets make the Pre-Engineering Specialty Center uniquely situated to capitalize on the advantages of location and enhance students' opportunities to prepare for STEM careers.

The administrative staff of the Pre-Engineering Specialty Center is seeking the designation as a Governor's Career and Technical Academy for Engineering Studies in order to further establish the Center as a leader in high school engineering and engineering technology programs and move the existing program to an even higher level of rigor and

relevance. Building on the already established program, this proposal intends to address state and regional needs through the Science and Mathematics career pathway and the Engineering Technology career pathway. To this end, an advisory committee, comprised of representatives from the local school division, higher education, and area engineering organizations and industries is evaluating the existing program for relevance and rigor. The advisory committee (Appendix A) is comprised of the same members as the planning committee (Appendix B), as the planning members wished to actively provide guidance and input into the continuous improvement of the Pre-Engineering Specialty Center.

Seeking the designation as a Governor's Career and Technical Academy for Engineering Studies is a natural step towards enhancing the opportunities for students who desire more knowledge and preparation for further study of STEM fields. The faculty and administrative staff at Lloyd C. Bird High School, with the endorsement of central office personnel, believe the existing program rises to the criteria of a Governor's Academy; however, it is also recognized that meeting the expectations for this designation requires the program to move above and beyond the existing curriculum and program of study to a more rigorous and relevant program of study while adding an additional pathway. Ultimately, future students will be offered additional opportunities for training and education in STEM related courses and fields. Receiving the Academy designation would enhance the school's ability to offer students a rigorous and relevant curriculum that will ultimately address the need for highly qualified engineering personnel for tomorrow's workforce.

Rationale

Need

The 2007 Occupational Outlook Quarterly identifies STEM careers as fast growing occupations. The Bureau of Labor Statistics cites a healthy growth rate for all STEM occupations projected through the year 2014. Virginia, along with five other states, accounted for 40 percent of jobs in STEM careers across the country. Nationally, engineering and engineering technology careers show a projected growth rate of 10 percent - 15 percent in the decade from 2004 and 2014.

The Virginia Workforce Connection indicates several engineering related fields will experience significant growth through 2016. Aerospace engineering technician careers are projected to have over a 30 percent increase in employment from 2006 to 2016. Aerospace engineering should also see a 30 percent growth rate over the same decade, while biomedical engineering fields are projected to experience a 27 percent growth rate in the same ten years. Other engineering and engineering technology fields such as drafters, electronic technicians, and nuclear engineers are expected to show a state growth rate between 10 and 15 percent (<http://www.vawc.virginia.gov/analyzer/qsocproj.asp?session=OCCPROJ&setvar=True>).

Current Program

The Pre-Engineering Specialty Center at Lloyd C. Bird High School is a well-established and successful four-year program that provides selected students the opportunity to explore and experience the core skills necessary to pursue higher education and/or careers in science, technology, engineering, or mathematics (STEM). This college-preparatory curriculum is rigorous and designed to prepare students for a rapidly changing, technologically-based field of study. It incorporates field experiences in a variety of engineering disciplines and builds a solid base in workforce readiness skills such as problem solving and teamwork.

With the close of the 2007-2008 academic year, the Pre-Engineering Specialty Center had graduated 158 students. Of these graduates, 1 percent (2 students) entered the armed forces or a trade school, 1 percent (2 students) delayed entry into higher education for at least a semester but subsequently enrolled in a state university, and 2 percent (3 students) have not yet continued in higher education but all three have indicated that is their desire. The remaining 96 percent enrolled in some form of higher education. Graduating students have indicated a noticeable advantage at the collegiate level as a result of their participation in the Pre-Engineering Specialty Center.

Expansion Program

The Pre-Engineering Specialty Center, with support of the school and district administration, expanded the program to offer a three-year curriculum that emphasizes engineering technology with a pilot group of students starting in the 2008-2009 academic year. Students in this pathway start in the tenth grade. The intent is to serve those students who, prior to entering high school, had not considered an engineering-related field of study or perhaps, for a variety of reasons, did not have the opportunity to enter the program as a freshman. The establishment of this additional pathway gives students more options and allows more students to take advantage of this specialized program. Students receive training intended to prepare them for entry into higher education or the workforce with advanced skill sets that include problem solving and teamwork as well as the technical knowledge needed for STEM careers.

The administrative staff of the Pre-Engineering Specialty Center is seeking the designation as a Governor's Career and Technical Academy for Engineering Studies to highlight STEM fields, increase student interest in STEM fields, and further establish the Center as a leading secondary-school program for engineering and engineering technology.

Establishment of the Governor's Career and Technical Academy for Engineering Studies

Labor statistics and business/industry partner dialog indicates a need for highly-skilled workers in the engineering field. To capitalize on the resources of the existing program at Lloyd C. Bird High School, two viable STEM career pathways, a Science and Mathematics career pathway and an Engineering Technology career pathway, are proposed for the Governor's Career and Technical Academy for Engineering Studies. Within each career pathway, students will explore various engineering and engineering technology fields such as biotechnology, engineering drawing creation and development with AutoCAD, aerospace engineering, and/or manufacturing engineering. Both pathways are college preparatory while still allowing students to work toward industry certifications and earn Advanced Placement or dual enrollment credit while in high school. Students will be given the academic support to earn at least one appropriate industry certification. Additionally, in keeping with the intent of a Governor's Academy, workforce readiness skills are interwoven throughout the curriculum. As a result, students should be able to transition to higher education and then into the workforce with a solid academic and technical foundation and the soft skills necessary to find success in the workforce.

Program Description

Goals and Objectives

The Governor's Career and Technical Academy for Engineering Studies has as its goal to provide a program of studies that allows students to explore a wide range of engineering and engineering technology fields, while building an understanding of the core skills necessary to enhance students' ability to find success in higher education and the 21st century workplace. The rigorous academic curriculum is centered around lab experiences to better prepare students for a rapidly changing technologically based field.

The objectives of the Science and Mathematics career pathway and the Engineering Technology career pathway are to provide:

- An opportunity to take advanced classes in mathematics, science and other core-content courses that will result in college credit while in high school;
- A constant utilization of integrated computer skills;
- A basis of practical understanding through an emphasis on design projects;
- A detailed overview of expectations in a variety of engineering and engineering technology fields;
- Opportunities for field experiences to foster a deeper understanding of the correlation between class work and the work environment; and
- Information to help students make a more informed decision about their future educational and career plans.

As a result of the Science and Mathematics pathway and the Engineering Technology pathway, students will graduate having:

- Earned an advanced diploma, a standard technical diploma or an advanced technical diploma;
- Met the requirements for the Commonwealth Scholars course of study;

- Earned at least 9 college credits and/or an industry certification;
- Experienced a technologically enriched background;
- Gained an understanding of the various fields of engineering and engineering technology;
- Developed an appreciation of the correlations between classroom, laboratory, and field studies;
- Developed workforce readiness skills such as greatly enhanced written and oral communication skills;
- Participated in a job shadowing, internship, mentorship, cooperative education or service learning project experience;
- Gained a solid foundation in problem solving and teamwork skills; and
- Gained an advantage over other students who would be entering the engineering educational tract at the community college or university level and taking engineering courses for the first time.

Program Overview

The Science and Mathematics and Engineering Technology pathways provide a comprehensive secondary curriculum that gives students an opportunity to learn engineering concepts and principles through specialized engineering classes while applying engineering concepts in mathematics and science courses. Students enroll in a series of increasingly challenging classes geared to meet the criteria for the Commonwealth Scholars course of study. Students will also meet the requirements for an Advanced Diploma, a Technical Diploma or an Advanced Technical Diploma. In addition to completing coursework required for a high school diploma, students will select appropriate electives that will round out their comprehensive secondary education as well as further their progress toward their chosen career pathway. (See Appendix C).

Rigor and Relevance. The Science and Mathematics and Engineering Technology pathways are structured to link engineering classes to core content classes. For example, physics teachers work closely with engineering teachers to help students see the relevance and application of science concepts in engineering design classes. Additionally, students are encouraged to take dual enrollment classes wherever possible, according to students' interests and abilities. All students are expected to complete upper level math courses through pre-calculus and/or calculus (depending on pathway) and must be taking an advanced placement or dual enrollment science class during their senior year.

Governor's Exemplary Standards Award Program for Career and Technical Education. The administrative staff of the Governor's Academy for Engineering Studies intends to fully participate in the Governor's Exemplary Standards Award Program for Career and Technical Education. This is one of several ways Chesterfield County will increase the rigor of its existing specialty center as it becomes the Governor's Career and Technical Academy for Engineering Studies.

STEM Career Pathways. An increased emphasis is placed on STEM careers through the Science and Mathematics pathway and the Engineering Technology pathway. Within each program of study, students have opportunities to explore various engineering and engineering technology fields that involve engineering applications that require the use of science, mathematics and technology. Through engineering design classes, students learn about engineering in general and the various applications of technology throughout the engineering field. Additionally, mathematics and science classes are infused with engineering applications to help students see the connection between these content areas.

Course Selections and Potential Careers. Students will enter the Academy with an established interest in engineering. All middle school students in Chesterfield County are made aware of high school offerings through recruitment fairs and open houses. Two middle

school recruitment fairs occur in the fall of each school year, one on each end of the County to make it easier for students and parents to attend. After the recruitment fairs, the Academy will hold its own open house. Interested students and parents will attend to hear more specifics about the program, with special presentations from previous graduates, current students, parents and teachers.

In addition to the regular recruitment activities, there is the annual Engineering Olympics for Chesterfield County seventh graders. For this event, seventh-grade teams of four students each are given various engineering challenges in a friendly competitive setting. Interacting with current students in the engineering program, these middle school students get a taste of what it means to learn about engineering in a hands-on, team approach. Teams of all girls are encouraged as a way to foster girls' interest in engineering. As an underrepresented population in most STEM fields, it is especially important to encourage and foster engineering to this population. Additional outreach opportunities are constantly being sought. For the past two years, the robotics team has presented at the J.B. Watkins science night festivities. Plans are currently underway to recruit pre-engineering students to assist in a children's engineering initiative during summer school sessions at a division elementary school.

The programs of study for the Science and Mathematics and the Engineering Technology pathways allow students to explore a wide variety of potential careers, examining not just the working conditions and job opportunities but also the educational requirements for a given field. Additionally, students meet with school counselors to develop an educational plan to help students obtain their academic and career goals. As students progress through the curriculum, they are able to narrow their field of study through year-long engineering electives. During senior year, participation in career research, service learning, mentorship, internship, job shadowing, work-study or cooperative education is required.

College Readiness. Students completing the Science and Mathematics pathway or the Engineering Technology pathway will have met the criteria for a Commonwealth Scholars course of study. Additionally, engineering courses and other related Career and Technical Education (CTE) courses such as Architectural or Engineering Drawing qualify students to earn Technical or Advanced Technical Diplomas.

Dual enrollment and advanced placement classes will expose students to the rigor of college work and prepare students for higher education. The ability to earn dual enrollment credit gives students an added incentive to pursue higher education because students can enter college having earned a semester or more of credit. Upper-level core content classes and upper level engineering courses give students confidence in their ability to tackle the challenge of university studies.

Based on the division's articulation agreement with John Tyler Community College, dual enrollment courses are taught by high school faculty members that meet the same requirements as the faculty on the John Tyler Community College campus. Consequently, any dual enrollment credit earned while enrolled in either pathway will transfer to John Tyler Community College. John Tyler Community College has reviewed the dual enrollment course offerings to assure students in either pathway have maximum potential for transferable credit into the college's engineering and engineering technology degree programs. John Tyler Community College has an articulation agreement with Old Dominion University for Engineering Technology and with the University of Virginia for Engineering. Working with the community college system, through the strong presence of dual enrollment opportunities, gives students a jump-start on college studies and the potential to complete engineering and engineering technology degrees from two major universities in Virginia.

Virginia's Workplace Readiness Skills. Interwoven through all engineering and core content classes are workplace readiness skills. Each course is designed to incorporate

opportunities for teamwork, project-based learning, and presentations. This ensures students develop core academic skills such as reading, writing, mathematics, science, and computer literacy, and demonstrate speaking, self-presentation, reasoning, problem solving, ability to work as a group or team member to accomplish goals, and other Workplace Readiness Skills standards. Workforce readiness skills will be measured by the National Occupational Competency Testing Institute (NOCTI). Students will also be given the opportunity to sit for NOCTI's Pre-Engineering assessment.

Students, Grade Levels, and Admission Requirements

Number of Students. The current program serves approximately 214 students in the Science and Mathematics pathway, an average of at least 50 students at each grade level. The Engineering Technology program is in its first year of existence and currently serves 16 students. A target enrollment of 50 students per grade level is the goal for the three-year program as well, though there is flexibility to admit additional students if there is increased interest and sufficient number of qualified candidates. When fully implemented, the program will serve at least 350 students out of the school's enrollment population of approximately 1,800 students. It should be noted that several engineering elective classes are not restricted to just students enrolled in the program but open to the general school population, and many engineering students take CTE classes offered for the general education population. As a result, even more students will receive opportunities to explore engineering fields than those officially enrolled in the program and engineering students will have the opportunity to take even more CTE as a result of this Academy.

Grade Level. Various outreach programs allow middle school students to consider all that is involved in engineering and engineering technology to help determine if entering a secondary engineering program might be right for them. Increasing exposure to engineering activities through outreach programs and the Engineering Olympics provides elementary and

middle school students background when considering a STEM course of study in high school. Guidance counselors are kept abreast of the academic requirements for entry into the pre-engineering program to help guide potential students to take the appropriate coursework to find success in high school STEM studies.

Serving all high school grade levels, the Science and Mathematics curriculum starts in the ninth grade and the Engineering Technology curriculum starts in the tenth grade. For both programs, students follow a prescribed curriculum that provides a comprehensive course of study to give each grade level a balance of elective and engineering courses in addition to required core-content courses.

Admission Requirements. Career planning starts in the middle school years with school counselors meeting with individual students, helping them identify academic goals and plan an appropriate course of study. Students are given a career interest inventory (Virginia Education Wizard) to help them consider all the possible careers that suit their talents and strengths. Middle school guidance counselors are also the primary point of contact for information about the division specialty center offerings.

Eighth-grade students applying for the four-year curriculum are ranked according to grade point average, teacher recommendation, score on their admission essay, and the score on a standardized mathematics aptitude test. The top 50 to 55 candidates are offered a seat in the incoming freshmen class. Typically, there are 125 to 150 applicants for the 50-55 seats in the incoming freshmen class. Students who were not offered acceptance in the Science and Mathematics program are surveyed for interest during the application process for the Engineering Technology program and offered the opportunity to apply for it the following year. If accepted, these students would start the program the beginning of their sophomore year. Additional students are recruited for Engineering Technology from the general student population during the second quarter of their freshmen year. For Engineering Technology,

students must have at least a C average in their core-content courses and have passed all applicable state-mandated Standards of Learning tests for previous courses. Two teacher recommendations and a writing sample are also required. All qualified candidates will be accepted for the three-year program. Additionally, students must be on track to have completed geometry by the start of their sophomore year so that they can enroll in Engineering Algebra II. Currently, there are some freshmen who did not take Algebra I until high school thus making it necessary for them to take geometry during summer school to qualify for admission to the three-year program. However, with the start of the 2008-2009 academic year all Chesterfield County eighth graders are to be enrolled in Algebra I thereby eliminating this issue for future cohorts.

Completion Requirements

Students completing the four-year Science and Mathematics pathway will earn an advanced studies diploma with up to 30 high school credits awarded. The three-year Engineering Technology pathway program participants will earn 28 credits. Both pathways meet the requirements for the Commonwealth Scholars course of study. Both programs include opportunities to earn dual enrollment credit in English, mathematics, and history, giving students an opportunity to start on a college degree while in high school. Advanced placement credit is required for both programs, preparing students for the advanced rigor of university studies.

Benchmarks

College Placement Test. All students will sit for the PSAT test during their sophomore year. Students qualifying through their PSAT math and verbal scores will be eligible to take dual enrollment classes. The local community college placement test is administered on-site for those students needing additional testing to qualify for dual enrollment. For students who

fail to qualify for dual enrollment coursework, plans are underway to offer students an opportunity to take a semester-long SAT preparation class and semester dual enrollment, non-transferable mathematics course intended to strengthen their academic skills. Successful completion of these courses enables students to qualify to take transferable dual enrollment credits in mathematics and other dual enrollment courses.

NOCTI Assessments. Besides a strong foundation in all academic content areas, Virginia's Workplace Readiness Skills are interwoven throughout the curriculum. Students develop communication skills through a variety of oral and written presentations across multiple disciplines. Engineering courses will be designed to incorporate opportunities for teamwork, project-based learning, and presentations, thereby ensuring that students will develop core academic skills such as reading, writing, mathematics, science and computer literacy, and be able to demonstrate speaking, self-presentation, reasoning, problem solving, ability to work as a team member to accomplish goals, and other Workplace Readiness Skills standards.

Students will earn industry certifications where applicable (i.e., IC³ Certification, MOS certification or Autodesk Application Certification Program). These opportunities to earn industry certifications are being added to our program to provide additional relevance to our designation as a Governor's Academy. Additionally, students will sit for the NOCTI Workplace Readiness Skills assessment and the NOCTI Pre-Engineering Assessment to further demonstrate their mastery of engineering concepts and applications.

Work-based Experience

Students may seek additional high school credit through completion of a summer internship with local engineering firms or related businesses. This internship requires a minimum of 80 hours of work, documented through a work log and periodic evaluations. In addition to opportunities for direct work-based experience, students will be exposed to workplace norms and expectations through guest speakers, field trips to local businesses,

mentorships and service learning projects. The engineering curriculum is designed to model the workplace through the use of teamwork and projects. In these simulated workplace experiences, students learn to hold themselves accountable as well as hold team members accountable for the work to be done thus reinforcing leadership skills and instilling work ethics.

Instructional Schedule

The school day and calendar year will be determined by County policy in keeping with state requirements. In Chesterfield County, high school students follow an alternating block schedule with students taking a minimum of seven courses per school year. Both programs of study follow the academic requirements as set by the County and state. The sequence of courses for both programs requires four years of science, mathematics, history and English. Engineering electives as well as electives such as world language, fine arts, and health and physical education are required. Career and Technical Education electives are available and taken according to student interests. Upper level mathematics, English, and history classes are offered as dual enrollment allowing students to earn at least 18 transferable credits. As a result, students completing two years of world language will meet the minimum requirements for the Commonwealth Scholars course of study, and those students completing either three years of world language or two years of two separate world languages will earn an advanced diploma. All Academy students will qualify for the Technical or Advanced Technical Diploma.

Infrastructure

Lloyd C. Bird High School is a comprehensive high school with fully equipped wood and metal workshops, science and engineering labs, and many other rooms and pieces of equipment needed to support a comprehensive secondary academic program. Though the

original building was completed in the mid-1970s, the physical plant is very well maintained and provides some of the needed space and equipment for an engineering and engineering technology program. A 26,500 square-foot expansion is on schedule to open in April 2009, rounding out the physical plant and providing support for the engineering programs. This new addition will provide a fully equipped engineering lab and a second lab that serves a dual purpose as an engineering and physics lab. The building addition provides an additional physics lab, a chemistry lab, and two biology labs. A 28-seat technical drawing/AutoCAD lab as well as two 28-seat computer labs enhance technology needs. A large presentation room will provide space to support student presentations as well as the ability to hold academic seminars or host guest speakers for more than one class at a time. Additional classrooms, as well as an office for the coordinator of the engineering program, are also housed in the new addition.

Internal Evaluation Process

During the application process to seek the designation as a Governor's Career and Technical Academy for Engineering Studies, a planning committee was formed. The planning committee, made up of representatives for K-12 education, higher education, business, and industry representatives, assisted in evaluating the current program of study and the development of expansion and enhancements to insure rigor and relevance of the proposed program. At the conclusion of the proposal process, the planning committee will change its designation to an advisory board. The membership of the advisory board will remain the same as the planning committee to ensure a smooth transition and a continued focus on rigor and relevance.

The advisory board will convene regularly to evaluate the current curriculum and oversee any enhancements or changes as determined by the academic needs of the students or workforce needs of local businesses. The priority of the advisory committee is to evaluate

established curriculum to maximize students' opportunities to make a smooth transition into higher education and develop workplace readiness skills. To this end, the board will evaluate the Governor's Career and Technical Academy for Engineering Studies policies, procedures and outcomes. Survey evaluations from students, alumni, parents, faculty, and associated businesses will be used to further inform the board of the Academy's strengths and weaknesses.

The board will convene at least twice a year to review the program inputs and outcomes. An annual review will be conducted, analyzed, and reported to the Virginia Department of Education noting student achievement, accomplishment of the Academy's goals, and the growing needs of the community. Students, parents and staff will be asked to provide programmatic feedback online as part of the annual review.

Performance Measures

The proposed Governor's Career and Technical Academy for Engineering Studies is designed to support the goals of the Virginia Board of Education. Specifically, the Science and Mathematics and Engineering Technology pathways provide two programs of study that allow students to explore a wide range of engineering and engineering technology fields while building an understanding of the core skills necessary to enhance students' ability to find success in higher education and the 21st century workplace. The academic curriculum is both rigorous and centered around lab experiences to better prepare students for a rapidly changing technology-based field. The Virginia Board of Education's goals and the methods by which the Academy addresses these goals are specified as follows:

- 1) The Academy will maximize opportunities in preparing students for targeted careers by breaking down barriers between traditional core academics and CTE, between high school and postsecondary education and training, and between education and the workplace. The Governor's Career and Technical Academy for Engineering Studies

incorporates concepts learned in mathematics and science classes into engineering design projects taught in specialized engineering courses. Furthermore, oral and written presentation skills are emphasized in engineering courses allowing students to put to use those skills learned in English class. Finally, the history of engineering and engineering innovations disasters, and the effect of these developments on the world, is emphasized within the engineering curriculum connecting history and engineering classes. Written reports and oral presentations allow students to strengthen self-presentation skills emphasized in English class.

- 2) The Academy will raise student aspirations and attract more students to postsecondary education in preparation for technical careers. The Governor's Career and Technical Academy for Engineering Studies provides a rigorous, college-preparatory curriculum. The opportunity to earn at least 18 community college credits provides students with a strong incentive to continue on to higher education. The articulation agreement the local community college, John Tyler Community College, has with Old Dominion University and the University of Virginia, gives students an affordable option when considering higher education. Furthermore, whether seeking a two-year degree or a four-year degree, students will reap the benefit of taking dual enrollment classes by reducing the amount of time and financial commitment needed to earn a degree. At the same time, success in dual enrollment classes will help students realize that they have the ability to be successful in college.
- 3) The Academy will provide well-trained workers to support the recruitment of new businesses and industries to the Commonwealth and to meet the workforce needs of existing business and industry. Infused with practical, workplace readiness skills, the Governor's Career and Technical Academy for Engineering Studies also provides students opportunities to develop the soft skills necessary to find success in the

workplace, whether at the completion of a higher educational program or entering the workforce right out of high school.

Feedback from business partners, through work/study experiences with students, will enable the Governor's Career and Technical Academy for Engineering Studies to address workforce needs.

At this time, the program at Lloyd C. Bird High School has 230 students enrolled. As the roll out of the engineering technology program continues, and we receive the designation as a Governor's Career and Technical Academy, those numbers will increase. Currently there are 214 students enrolled in the Science and Mathematics career pathway. Of these students there are 67 females (31 percent) and 147 males (69 percent). There are 135 (63 percent) Caucasian students, 69 (32 percent) African-American students, 7 (3 percent) Asian students, and 3 (2 percent) Hispanic students. The Engineering Technology career pathway program is in its pilot year with 16 students enrolled. Of these students, there are 3 females and 13 males. There are 9 Caucasian students, 6 African-American students, and 1 Hispanic student.

The first year of the Academy (2009-2010) will serve to establish a baseline of positive measures for future comparison with a goal of improving all measures by at least 2 percent for the 2010-2011 school year. Goals will be re-evaluated at that time. The following data will be collected annually:

- Grade level break down of students by ethnicity and gender;
- Average GPA for each class;
- Number of students enrolled yearly in dual enrollment and advanced placement courses by grade level;
- Number of students participating in job shadowing, internships and mentorships;
- Number of students who complete the engineering and engineering technology program compared to starting cohort in order to monitor retention;
- Number of students entering higher education immediately after graduation;
- Number of students majoring or working in an engineering related field;
- Track students for five years after high school graduation to determine percentage who complete college within the first five years after high school graduation;
- Track students for five years after high school graduation to determine percentage who enter the workforce in STEM related fields;

- Number of students who earn some type of industry certification; and
- Track students who attend four-year postsecondary education after high school graduation to determine the percentage who require remediation.

The Academy will strive to recruit minority students so that the Academy population is reflective of the division's population. The Academy will also strive to reach a female enrollment of 40 percent, looking to increase female enrollment 2 percent annually until the target enrollment is met. Once baseline data have been collected and analyzed for students pursuing both career pathways, SMART (Strategic and Specific, Measurable, Attainable, Results-based and time-bound) goals for the program will be determined to increase the number of students meeting and exceeding the goals of the Academy. Data will be analyzed annually for trends. Should declines in measures be noted, a review of admission policies and program content will be conducted to determine the best way to reverse the trend. Additional data may be collected as opportunity and need arises.

Sustainability of Academy

The Pre-Engineering Specialty Center started in 2000. Since then, five graduating classes from this Science and Mathematics career pathway have proceeded to higher education or the workforce. Interest in this program has grown steadily since its inception with each subsequent class growing in size. The Engineering Technology career pathway started this year with a pilot cohort of 16 for the 2008-2009 academic year. Interest in this program appears to be growing with frequent inquiries from parents and students to discuss possible admission for next year.

Because the program has already been established, funding has been secured from the division. The establishment of an advisory committee will further support the program through business contacts and resources. These additional resources will further increase the ability of the Academy to serve the needs of the students and sustain interest in the years to come.

Administrative Procedures

Partnerships

Partnerships are a very important part of the Academy's organization. Using the division's Director of Business and Government Relations as a point of contact, several local engineering firms and industries have expressed a desire to serve on the advisory committee. Partnerships will be used to: 1) identify the needs of the local workforce and evaluate program content to ensure alignment with those needs; 2) provide opportunities for job shadowing and internships; 3) provide guidance to ensure curriculum is rigorous and relevant; and 4) assist in the internal evaluation process of the Academy. During the 2008-2009 academic year, business and industry representatives made special presentations to faculty and staff of Lloyd C. Bird High School in an effort to help teachers identify those workforce readiness skills needed in today's workplace they could emphasize in their classroom instruction. It is expected that more of the same type of collaborations between educational and business professionals will be conducted periodically in the future, either with the faculty of the Governor's Academy specifically or the with faculty as a whole, to keep faculty abreast of the ever changing demands in the workplace.

Student Recruitment, Selection Criteria and Admission

Student Recruitment. Recruitment for potential students will begin in middle school by offering students an opportunity to participate in the Engineering Olympics. This free event, hosted by the Pre-Engineering Program, is designed to give students engineering design experience through friendly competition in an effort to foster creative problem solving while introducing students to engineering principles and design. Middle school students will also have Academic Career Plans put together through the joint efforts of parents, guidance counselors and the students. Events such as the Engineering Olympics provide information to help students decide which career pathways peak their interests.

Much effort is made by the division to inform middle school students and parents of the various opportunities offered through each high school's specialty center. Two specialty center fairs are conducted each year to give students and parents an opportunity gather information and compare all of the division's specialty centers. Additionally, each specialty center has an open house allowing interested students a chance to learn more about the programs offered. The Pre-Engineering Specialty Center fully participates in all aspects of the recruitment process as designed by the division. Student recruitment for the three-year program is conducted through visits and presentations made in all ninth-grade English classes. Academy administration will work closely with the guidance department to help identify and encourage those students who may be interested in pursuing the Science and Mathematics career pathway or the Engineering Technology career pathway.

Selection Criteria and Admission. Student applicants to the Science and Mathematics career pathway will be evaluated during their eighth-grade year based on teacher recommendations, grade point average, written essay and the score in a standardized mathematics aptitude test. Students will be ranked according to their scores and the top 50–55 students will be offered a seat in the incoming freshmen class. Students for the Engineering Technology career pathway will be evaluated during their ninth-grade year based on teacher recommendations, grade point average, and written essay. Admission will also be contingent upon students having passed the Standards of Learning tests for any applicable ninth-grade core content class.

Code of Conduct and Attendance

Chesterfield County has a well established code of conduct and attendance policy. The full student conduct and attendance policy for the division may be found at http://www.chesterfield.k12.va.us/CCPS/About_CCPS/files/student_conduct.pdf. The code of conduct regulates aspects of student behaviors that promote success in a school setting.

The Chesterfield County Student Code of Conduct reinforces behaviors necessary for success in school and 21st century workforce readiness skills that promote ethics, punctuality, and attendance. The attendance policy sets the standard for student attendance and ties attendance to award of course credit. Missing more than ten days of class will result in no credit awarded for the class, even if a passing grade is earned. All students in the Governor's Career and Technical Academy for Engineering Studies will be held to the conduct and attendance standards established by the division.

Transportation

Transportation for students living out of the Lloyd C. Bird High School is already established through specialty center routes. Hub sites are established within three miles of students' homes. Students living within the attendance zone of Lloyd C. Bird High School will use the regular bus routes for transportation. The Governor's Career and Technical Academy for Engineering Studies will continue with this transportation plan.

Faculty

All faculty members hold Virginia teaching licenses. All teachers hold endorsements in the content taught and meet the standards for highly qualified teachers as set in the federal legislation No Child Left Behind. Three current instructors are trained engineers and worked in an engineering field prior to entering the teaching profession. All teachers of dual enrollment courses meet the same criteria as faculty teaching the comparable course on the community college campus and have been approved by John Tyler Community College.

Staff Development

The division has a well-developed staff development program designed to keep instructors up to date in best practices and current educational research. In preparation for the expansion of the Engineering Technology career pathway, faculty members and representatives from central office administration participated in a planning retreat conducted by Dr. Gene Bottoms, from the Southern Regional Education Board. Dr. Bottoms helped establish the criteria to connect core content classes to CTE standards. Regular staff development is required by the division and additional staff development will be scheduled as the program reviews indicate.

Ongoing staff development adhering to the guidelines developed with Dr. Bottoms is planned to provide faculty within the engineering program opportunities to develop cross-curricular plans to enhance career and technical concepts in core-content classes. For teachers working with students in the Engineering Technology career pathway, the master schedule is arranged to provide common planning to ensure a unified curriculum.

Staff Evaluation

The instructors and staff involved in the Governor's Career and Technical Academy for Engineering Studies will be evaluated using the guidelines and procedures outlined in the Chesterfield County Public Schools policy manual.

Parent, Student, and Community Involvement

There is already a strong parent support group affiliated with the current specialty center program, established to offer support and help to the engineering program. The parent group is well-organized and serves as an additional communication tool between school and home. Additionally, the parent group has assumed responsibility for providing students opportunities to socialize at least once a school year to promote team spirit and camaraderie.

The parent group is extremely supportive of this proposal to seek designation as a Governor's Career and Technical Academy for Engineering Studies.

Students are involved in the program beyond what is required in the classroom. Students have organized an Engineering Club, which provides an opportunity for students to socialize as well as pursue engineering related service projects. For example, the club serves the school community through regular tutoring sessions in science and periodically offers its assistance with any minor classroom repairs such as tightening table legs or fixing broken pieces of equipment. Participating in FIRST Robotics and VEX Robotics programs involves students in extracurricular activities that enhance classroom instruction and provide additional opportunities for students to see real-world applications of engineering and engineering technology. Students participate in numerous engineering competitions such as the National Engineering Design Challenge, Junior Engineering and Technology Society's annual competition (JETS TEAMS competition), and the Team America Rocketry Challenge. For the past two years students have also participated in NASA's Student Launch Initiative that required extensive work with NASA engineers and culminated in a trip to Marshall Space Flight Center, in Huntsville, Alabama, to launch their student-designed high-powered rocket. The community is involved through mentors working with rocketry and robotics teams as well as local engineering firms providing internships for students. Plans are underway to re-activate the school's Technology Student Association (TSA) program to expand opportunities for students to experience hands-on engineering, adding another opportunity to provide relevance as an Academy.

Efforts will continue to strengthen the link between parents, students, and the community. The establishment of the advisory committee has expanded community involvement providing opportunities for site visits, college visits, and guest speakers.

Budget Narrative

The Science and Mathematics career pathway within the Pre-Engineering Specialty Center at Lloyd C. Bird High School has been in existence since 2000. The County provided the start-up funds for this program when the program opened and funded the additional costs of equipment and supplies through the first four years. Currently, the County funds the program through instructional funds at a rate of approximately \$150 per pupil enrolled in the program. Student transportation is a part of the total transportation budget of the County and not an expense incurred by the specialty center. The funding plan will continue as a Governor's Academy.

The Engineering Technology pathway intends to absorb students primarily from the existing student population, eliminating the need for additional staffing. Since the Academy will operate within the comprehensive school program, FTEs are calculated for the entire school and teachers are assigned according to need and qualifications for specialized classes. The Governor's Academy will be considered a specialty center. Since all specialty center students are included in the total school population count, no additional FTEs are required for this program.

Many expenses related to the initial start up of the Engineering Technology career pathway program have already been met through Title II funds. Selected teachers from the four core-content areas, as well as selected administrative personnel, attended a workshop conducted by Dr. Gene Bottoms from the Southern Regional Education Board in May, 2008. This was a planning workshop focused on curriculum development and embedding Career and Technical Education projects into core curriculum content areas in anticipation of the establishment of the Engineering Technology career pathway for 2008-2009. Workshop costs of \$8,900, as well as a noncontractual stipend for participating teachers (\$2,000), were covered through Title II funds. Additional funding for teachers to write curriculum for some

specialized classes (\$1,900), was covered through Title V funds. Textbooks and curriculum support materials for classes associated with the Engineering Technology pathway program, \$2,7812, have already been purchased. Funding was met through the Office of Instruction and Curriculum during the 2008 fiscal year. In an effort to foster ongoing professional development, core-content teachers plus the engineering teacher for the Engineering Technology pathway program, are given a common planning for collaboration and planning purposes. This active professional learning community affords the opportunity for collaborative, ongoing professional development for teachers with no added budgetary demands.

All other expenses associated with the two pathways within the proposed Governor's Career and Technical Academy for Engineering Studies will be met through existing specialty center funding as provided by the County on an annual basis. The benefit of expanding an existing program is the fact that all necessary start-up costs for the Science and Mathematics career pathway have already been funded. The division's support of efforts to promote STEM training for students has permitted the start-up costs for the Engineering Technology career pathway program to be met. Merging these two programs into a Governor's Career and Technical Academy for Engineering Studies allows the division to capitalize on previous investments while future expansion and development will be absorbed by the existing personnel and infrastructure. Future budget needs for the proposed Governor's Career and Technical Academy for Engineering Studies will be met through instructional funds provided by the division for the current programs.

**GOVERNOR’S CAREER AND TECHNICAL ACADEMY FOR
ENGINEERING STUDIES
BUDGET**

A. Direct Costs	TOTAL			
	State Funds	Perkins Funds	Other funds (Local or grant funds to be described in Budget Narrative)	In-Kind
1. Personnel---1000			\$3,900	
2. Employee Benefits--- 2000			\$0	
3. Purchased/Contractual Services----3000			\$8,900	
4. Internal Service---4000			\$0	
5. Staff Development--- 5000			\$0	
6. Summer Component Activities---5000			\$0	
7. Travel---5000			\$0	
8. Contractual Services --- 5000			\$0	
9. Materials and Supplies- --6000			\$27,812	
10. Equipment---8000			\$0	
11. Facilities---8000			\$0	
B. Indirect Costs			\$0	
Total			\$40,612	

Conclusion

The administrative staff of Lloyd C. Bird High School, with the endorsement of division central office personnel, respectfully submits the proposal for the designation as a Governor’s Career and Technical Academy for Engineering Studies. This proposal delineates two career pathways within STEM studies. The Science and Mathematics career pathway affords

students the opportunity to pursue aerospace engineering, architectural engineering, bio-medical engineering, and computer science incorporated into manufacturing engineering. The Engineering Technology career pathway allows students to pursue bioengineering technology, aerospace engineering technology, architectural/civil engineering technology, and computer electronics technology. There are opportunities for students to cross-over between these fields of engineering and engineering technology to maximize their exposure to STEM careers.

The current program has established a track record of success and the recent addition of a second career pathway, Engineering Technology, has given even more students a chance to pursue a specialized curriculum that promotes STEM careers. The administrative staff of Lloyd C. Bird and the current Pre-Engineering Specialty Center see the opportunity to become a Governor's Career and Technical Academy for Engineering Studies as a way to strengthen the program and raise the standards for students. The emphasis on and additional offerings of dual enrollment courses and the added opportunity to earn industry certifications will give our students a decided advantage when they enter higher education and the workforce. Increase exposure to the workplace through a heightened partnership with area businesses and industries will provide opportunities a high school student might not receive in a typical high school curriculum. This already strong program will only become stronger through meeting the criteria required to be considered a Governor's Career and Technical Academy.

Appendices

Appendix A: Advisory Board Members

Advisory Board Members

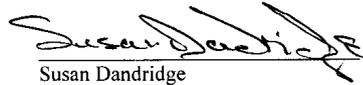
Member	Affiliation
Nancy R. Hoover	Academy Coordinator Chesterfield County Public Schools
Susan Dandridge	Grants Coordinator Chesterfield County Public Schools
Ceal Donahue	Program Manager, CTE Chesterfield County Public Schools
Lynda Gillespie, Ph.D.	Director of Technology Chesterfield County Public Schools
Michael Howell, E.I.T.	Educational Outreach Chair, American Society of Civil Engineers and Structural Engineers Austin, Brockenbrough and Associates, L.L.P.
Kelly Klanian	Engineer 2 Northrop Grumman
Debra Marlowe	Director of Community Relations and Legislative Liaison Chesterfield County Public Schools
Glen Miller, Ph.D	Manager, School Improvement Chesterfield County Public Schools
Melody Moore, Ph.D.	Dean of Professional & Technical Studies John Tyler Community College
Chad Pace	Production Control Supervisor Mazda North American Operations
Duncan Steward, PE	Project Manager MBP, Inc. – McDonough, Bolyard and Peck, Inc.
Bob Stolle	Executive Vice President Core Consulting
Beth N. Teigen	Principal, Lloyd C. Bird High School Chesterfield County Public Schools
Eric Young	Manager – Projects and Service Excellence Bon Secours and St. Francis Medical Center

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Governor's Career and Technical Academy for
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4. Provide opportunities for site visits and other enhancement activities to promote engineering, engineering technology and encourage students' pursuit of higher education.
5. Assist in the internal evaluation process of the program.

By signing this agreement, I certify that I am a willing participant and supporter in the establishment of the Governor's Career and Technical Academy for Engineering and Engineering Technology Studies.


Susan Dandridge
Grants Coordinator
Chesterfield County Public Schools

3/10/07
Date


Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

3/10/09
Date

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Cecilia M. Woodhull
PROGRAM MANAGER CTE
(Name) CCPS
(Title)
(Affiliation)

12/02/08
Date

Nancy R. Hoover
Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

12-12-08
Date

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Governor's Career and Technical Academy for
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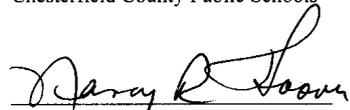
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Dr. Lynda Gillespie
Director of Technology
Chesterfield County Public Schools

March 10, 2009
Date


Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

3-10-09
Date

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Michael Howell, EIT
Education Outreach Chair
American Society of Civil Engineers, Richmond

12-11-2008
Date



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Academy Coordinator
Chesterfield County Public Schools

12-12-08
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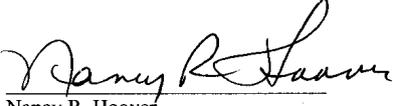
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Structural Engineer
Austin Brockenbrough & Assoc., L.L.P.

12-11-2008
Date



Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

12-11-08
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(Name) Kelly
(Title) Engineer 2
(Affiliation) Northrop Grumman

12-02-08
Date


Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

12-12-08
Date

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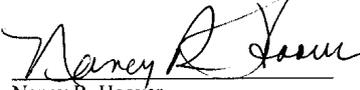
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Debra Marlow
Director of Community Relations and Legislative Liaison
Chesterfield County Public Schools

3/11/09
Date



Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

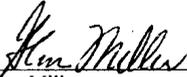
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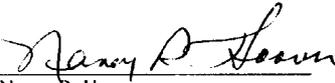
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Dr. Glen Miller
Manager, School Improvement
Chesterfield County Public Schools

3/10/09
Date



Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

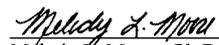
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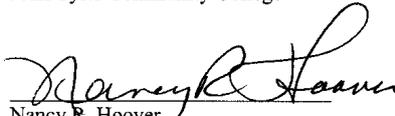
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Melody L. Moore, Ph.D.
Dean of Professional and Technical Studies
John Tyler Community College

12/8/08
Date



Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

12-12-08
Date

**Advisory Board Agreement
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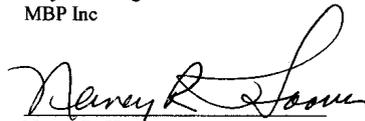
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Duncan Stewart, PE
Project Manager
MBP Inc

2/16/09
Date



Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

2-16-09
Date

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(Name) Bob Stelle
(Title) EVP
(Affiliation) Core Consulting

12/12/08
Date



Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

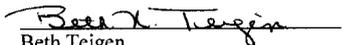
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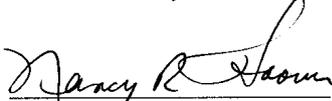
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Beth Teigen
Principal, Lloyd C. Bird High School
Chesterfield County Public Schools

3/10/09
Date


Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

3/10/09
Date

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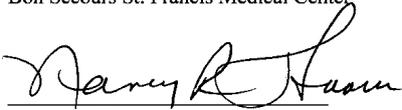
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Eric M. Young
Manager, Projects & Service Excellence
Bon Secours St. Francis Medical Center

12/11/2008
Date


Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

12-11-08
Date

Appendix B: Planning Committee Members

Planning Board Members

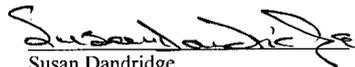
Member	Affiliation
Nancy R. Hoover	Academy Coordinator Chesterfield County Public Schools
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Ceal Donahue	Program Manager, CTE Chesterfield County Public Schools
Lynda Gillespie, Ph.D.	Director of Technology Chesterfield County Public Schools
Michael Howell, E.I.T.	Educational Outreach Chair, American Society of Civil Engineers and Structural Engineers Austin, Brockenbrough and Associates, L.L.P.
Kelly Klanian	Engineer 2 Northrop Grumman
Debra Marlowe	Director Community Relations and Legislative Liaison Chesterfield County Public Schools
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Eric Young	Manager – Projects & Service Excellence Bon Secours and St. Francis Medical Center

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2. Identify the needs of the community and workforce.
3. Assist in the evaluation of the facilities.
4. Assist the program coordinator in the alignment of course objectives with the needs of the workforce and higher education.
5. Assist in the evaluation of the programs, courses, and overall operation of the academy.

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Susan Dandridge
Grants Coordinator
Chesterfield County Public Schools

3/19/07
Date


Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

3-10-09
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Cecilia M. Marshall
Program Manager-CTE
(Name) CCPS
(Title)
(Affiliation)

12/02/08
Date

Nancy R. Hoover
Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

12-12-08
Date

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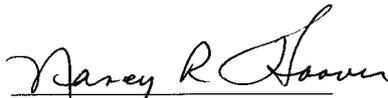
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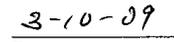
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Dr. Lynda Gillespie
Directory of Technology
Chesterfield County Public Schools


Date


Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools


Date

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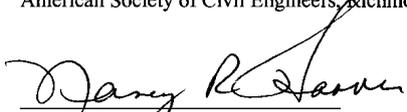
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12-11-2008
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Chesterfield County Public Schools

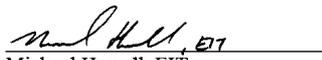
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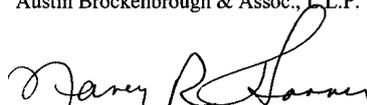
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Michael Howell, EIT
Structural Engineer
Austin Brockenbrough & Assoc., L.L.P.

12-11-2008
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Chesterfield County Public Schools

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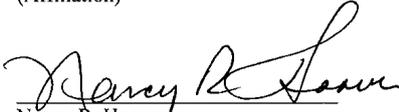
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(Name) Kelly N. [unclear]
(Title) Engineer 2
(Affiliation) Northrop Grumman

12-02-08
Date



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Academy Coordinator
Chesterfield County Public Schools

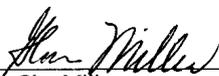
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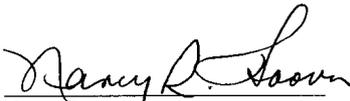
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Dr. Glen Miller
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Chesterfield County Public Schools

3/10/09
Date



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By signing this agreement, I certify that I am a willing participant and supporter in the establishment of the Governor's Career and Technical Academy for Engineering and Engineering Technology Studies.

Debra Marlow
Debra Marlow
Director of Community Relations and Legislative Liaison
Chesterfield County Public Schools

3/11/09
Date

Nancy R. Hoover
Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

3-11-09
Date

**Planning Committee Agreement
Governor's Career and Technical Academy for
Engineering and Engineering Technology Studies**

An essential component of the establishment of the Governor's Career and Technical Academy for Engineering and Engineering Technology Studies is an active and knowledgeable planning committee. As a member of this planning committee, I will:

1. Assist in the development of academy goals and objectives.
2. Identify the needs of the community and workforce.
3. Assist in the evaluation of the facilities.
4. Assist the program coordinator in the alignment of course objectives with the needs of the workforce and higher education.
5. Assist in the evaluation of the programs, courses, and overall operation of the academy.

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Melody L. Moore, Ph.D.
Dean of Professional and Technical Studies
John Tyler Community College

12/8/08
Date



Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

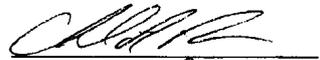
12-12-08
Date

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5. Assist in the evaluation of the programs, courses, and overall operation of the academy.

By signing this agreement, I certify that I am a willing participant and supporter in the establishment of the Governor's Career and Technical Academy for Engineering and Engineering Technology Studies.



(Name) C. L. Rice
(Title) Production Control Supervisor
(Affiliation) Yulee North American Operations
Date 12/10/08



Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools
Date 12/10/08

**Planning Committee Agreement
Governor's Career and Technical Academy for
Engineering and Engineering Technology Studies**

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2. Identify the needs of the community and workforce.
3. Assist in the evaluation of the facilities.
4. Assist the program coordinator in the alignment of course objectives with the needs of the workforce and higher education.
5. Assist in the evaluation of the programs, courses, and overall operation of the academy.

By signing this agreement, I certify that I am a willing participant and supporter in the establishment of the Governor's Career and Technical Academy for Engineering and Engineering Technology Studies.



Duncan Stewart, PE
Project Manager
MBP Inc

2/16/09
Date



Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

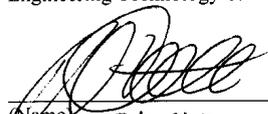
2-16-09
Date

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2. Identify the needs of the community and workforce.
3. Assist in the evaluation of the facilities.
4. Assist the program coordinator in the alignment of course objectives with the needs of the workforce and higher education.
5. Assist in the evaluation of the programs, courses, and overall operation of the academy.

By signing this agreement, I certify that I am a willing participant and supporter in the establishment of the Governor's Career and Technical Academy for Engineering and Engineering Technology Studies.



(Name) Rob Stolle
(Title) EUP
(Affiliation) Core Consulting

12/12/08
Date



Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

12/12/08
Date

**Planning Committee Agreement
Governor's Career and Technical Academy for
Engineering and Engineering Technology Studies**

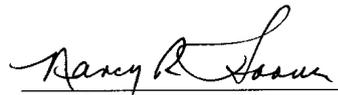
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1. Assist in the development of academy goals and objectives.
2. Identify the needs of the community and workforce.
3. Assist in the evaluation of the facilities.
4. Assist the program coordinator in the alignment of course objectives with the needs of the workforce and higher education.
5. Assist in the evaluation of the programs, courses, and overall operation of the academy.

By signing this agreement, I certify that I am a willing participant and supporter in the establishment of the Governor's Career and Technical Academy for Engineering and Engineering Technology Studies.


Beth Teigen
Principal, Lloyd C. Bird High School
Chesterfield County Public Schools

3/10/09
Date


Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

3/10/09
Date

**Planning Committee Agreement
Governor's Career and Technical Academy for
Engineering and Engineering Technology Studies**

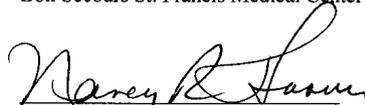
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2. Identify the needs of the community and workforce.
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5. Assist in the evaluation of the programs, courses, and overall operation of the academy.

By signing this agreement, I certify that I am a willing participant and supporter in the establishment of the Governor's Career and Technical Academy for Engineering and Engineering Technology Studies.


Eric M. Young
Manager, Projects & Service Excellence
Bon Secours St. Francis Medical Center

12/11/2008
Date


Nancy R. Hoover
Academy Coordinator
Chesterfield County Public Schools

12/11/08
Date

Appendix C: Plan of Study for Governor’s Career and Technical Academy for Engineering Studies



Commonwealth of Virginia Plan of Study

Student Name: _____
 School: Lloyd C. Bird High School
 Date: _____

Cluster: Science, Technology, Engineering & Mathematics Pathway: Science & Mathematics

This Career Pathway Plan of Study can serve as a guide, along with other career planning materials, as learners continue on a career path. Courses listed within this plan are only recommended coursework and should be individualized to meet each learner’s educational and career goals. This Plan of Study, used for learners at an educational institution, should be customized with course titles and appropriate high school graduation requirements as well as college entrance requirements.

EDUCATION LEVELS	GRADE	English/ Language Arts	Mathematics	Science	Social Studies/ Science	Other Required Courses Recommended Electives Learner Activities	Recommended Career and Technical Courses Source: Administrative Planning Guide www.doe.virginia.gov/VDOE/ Instruction/CTE/apg/	SAMPLE – Occupations Relating to This Pathway: www.doe.virginia.gov/VDOE/ Instruction/CTE/careerclusters/ www.careerclusters.org www.cteresource.org/cpg/
Graduation Requirements: http://www.doe.virginia.gov/2plus4in2004/index.shtml								
MIDDLE	7	1110 English Grade 7	3112 Math Grade 8	4115 Life Science Grade 7	2354 US History: 1877 to Present	6150 Keyboarding or 8461 Inventions & Innovations – 36 Wks	NOTE: Use state course titles 9070/9071 Career Investigation – Phases I & II	<ul style="list-style-type: none"> - Agricultural Engineer/Technician - Application Engineer - Architectural Engineer - Automotive Engineer - Biomedical/Biotechnology Engineer - Chemical Engineer - Civil Engineer - Communications Engineer - Computer Engineer - Computer Hardware Engineer- - Electrical/Electronic/Engineering Technician - Electrical Engineer - Geothermal Engineer - Industrial Engineer/Technician - Manufacturing Engineer/Technician - Marine Engineer - Mechanical Engineer - Metallurgist - Mining Engineer - Nuclear Engineer - Petroleum Engineer - Product/Process Engineer - Systems Engineer
	8	1120 English Grade 8	3130 Algebra I or 3143 Geometry	4125 Physical Science Grade 8 or 4210 Earth Science I	2357 Civics & Economics	8462 Technological Systems – 36 Wks	9072 Career Application – Phase III	
<p>Career Assessment: Administration of a career assessment instrument is appropriate at the middle school level to help students and their parents plan for high school (Virginia’s Career Planning System or other assessment product).</p>								

EDUCATION LEVELS	GRADE	English/ Language Arts	Mathematics	Science	Social Studies/ Science	Other Required Courses Recommended Electives Learner Activities	Recommended Career and Technical Courses Source: Administrative Planning Guide www.doe.virginia.gov/VDOE/ Instruction/CTE/apg/	SAMPLE – Occupations Relating to This Pathway: www.doe.virginia.gov/VDOE/ Instruction/CTE/careerclusters/ www.careerclusters.org www.cteresource.org/cpg/
SECONDARY	9	1130 English Grade 9	3143 Geometry or 3135 Algebra II	4510 Physics I	2215 World History & Geography to 1500 AD	Required: 7300 Health & PE Grade 9 7405 Health, PE & Driver Education 5510/5520/5530 Spanish I, II & III or 5310/5320/5330 Latin I, II & III or 5210/5220/5230 German I, II & III or 5110/5120/5130 French I, II & III 8450 Engineering Explorations (9) 8443 Engineering Design & Development – 36 Wks (10) 4612 Local Science Elective - Aerospace Engineering (11) or 8085 Biotechnology Foundations (11) or 8437 Architectural Drawing/Design (11) or 8442 Computer Integrated Manufacturing(11) 8441 Principles of Engineering – 36 Wks (11) 8443 Engineering Design & Development (12) Highly Recommended: 3192 AP Statistics	1300 Speech Fundamentals 1302 Adv Speech 6640 Programming – Multiple Courses & Levels 6670 Information Technology Fundamentals 6151 Keyboarding Application 6612 Computer Information Systems – 36 Wks 6641 Adv Programming 8415 Communication Systems – 36 Wks 8435 Technical Drawing/Design 8436 Engineering Drawing/Design 8437 Architectural Drawing/Design 8438 Advanced Drawing & Design 6115 Principles of Business & Marketing – 36 wks 6612 6810 DE Business Education – Dual Enrollment	
	10	1140 English Grade 10	3135 Algebra II or 3162 Math Analysis/Pre-Calc	4310 Biology I	2216 World History & Geography: 1500 to Present or 2380 AP World History			
	11	1150 English Grade 11 or 1196 AP Language & Composition	3162 Math Analysis/Pre-Calc or DE 3230 DE Mathematics I - Analysis/Pre-Calc	4410 Chemistry I	2360 Virginia & US History or 2950DE History & Social Science I - Virginia & US History or 2319 AP World History			
	12	1160 English Grade 12 or 1195 AP English Literature or 1600 DE English I - College Composition	3160 Adv Math - HS Calculus or DE3231 DE Calculus 3177 AP Calculus AB	4370 AP Biology or 4470 AP Chemistry or 4270 AP Environmental Science or 4570 AP Physics C	2440 Virginia and US Government or 2951 DE History & Social Science II - Virginia and US Government or 2445 AP US & Virginia Government			
High school courses in the pathway offered locally for college credit should be coded: DE (Dual Enrollment) and/or VC (Validated Credit)								



Commonwealth of Virginia Plan of Study

Student Name: _____
 School: Lloyd C. Bird High School
 Date: _____

Cluster: Science, Technology, Engineering & Mathematics Pathway: Science & Mathematics (continued)

This Career Pathway Plan of Study can serve as a guide, along with other career planning materials, as learners continue on a career path. Courses listed within this plan are only recommended coursework and should be individualized to meet each learner's educational and career goals. This Plan of Study, used for learners at an educational institution, should be customized with course titles and appropriate high school graduation requirements as well as college entrance requirements.

<p>List related certifications/credentials approved by VDOE and offered locally: http://www.doe.virginia.gov/VDOE/Instruction/CTE/apg/ (Go to Certification – License Section) Pre-Engineering Assessment (NOCTI) Virginia Workplace Readiness Assessment (NOCTI) and IC³ Certification (Certiport) Microsoft Office Specialist (MOS) (Microsoft) CAD Assessment (NOCTI) Autodesk Application Certification Program (Autodesk) Pre-Skills Assessment for Mastercam Certification (NOCTI)</p>	<p>Additional Learning Opportunities: CTSO Organization(s): <input type="checkbox"/> DECA <input type="checkbox"/> FBLA <input type="checkbox"/> FCCLA <input type="checkbox"/> FFA <input type="checkbox"/> FEA <input type="checkbox"/> HOSA <input type="checkbox"/> SkillsUSA <input checked="" type="checkbox"/> TSA</p> <p>Work-Based Learning: <input checked="" type="checkbox"/> Career Research <input checked="" type="checkbox"/> Cooperative Education <input checked="" type="checkbox"/> Internship <input checked="" type="checkbox"/> Mentorship <input checked="" type="checkbox"/> Job Shadowing <input checked="" type="checkbox"/> Service Learning Project <input type="checkbox"/> Student Apprenticeship</p>
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Postsecondary: Placement Assessments such as COMPASS & SAT II College Entrance Exams such as ACT & SAT

POSTSECONDARY	SAMPLE POSTSECONDARY PROGRAMS RELATED TO THIS CAREER PATHWAY Individual plans must include locally agreed upon courses at the postsecondary level (See page 2)			
	Pathway	Associate Degree, College Certificate, or Apprenticeship	Bachelors Degree	Postgraduate Degree
		Associate in Applied Science Degree – Mechanical Engineering Technology	Engineering	

College: John Tyler Community College School Division(s): _____

Postsecondary: Placement Assessments such as COMPASS & SAT II

POSTSECONDARY - COMMUNITY COLLEGE or APPRENTICESHIP - Determined Locally	Semester	English	Mathematics	Science	Social Studies	Required Courses or Recommended Electives			
	POSTSECONDARY PLAN OF STUDIES MUST INCLUDE POSTSECONDARY ACADEMIC, CTE, AND OTHER ELECTIVE COURSES APPROPRIATE FOR AN ASSOCIATE DEGREE.								
	Year 1 1 st Semester	ENG111 College Composition I	MTH173 Calculus with Analytical Geometry 1	CM111 – College Chemistry I	Humanities Elective *	EGR120 – Introduction to Engineering			SDV100 College Success Skills
	Year 1 2 nd Semester	ENG112 – College Composition II	MTH174 – Calculus with Analytical Geometry III	CHM112 – College Chemistry II	Social Science Elective**	EGR126 – Computer Programming for Engineers	EGR140- Engineering Mechanics - Statics		
	Year 2 1 st Semester		MTH277 – Vector Calculus	PHY241 – General University Physics I	Social Science Elective **	EGR245 – Engineering Mechanics – Dynamics	EGR248 – Thermodynamics for Engineers		HLT/PED – Health or Physical Education
Year 2 2 nd Semester		MTH279 – Ordinary Differential Equations	PHY242 General University Physics	Humanities Elective *	EGR246 – Mechanics of Materials				
College courses offered locally in the high school for college credit should be coded: DE (Dual Enrollment) and/or VC (Validated Credit)									
Related Industry Certifications Available:					Additional Suggested Learning Opportunities:				
					Work-Based Learning: <input type="checkbox"/> Cooperative Education <input type="checkbox"/> Internship <input type="checkbox"/> Mentorship <input type="checkbox"/> Job Shadowing <input type="checkbox"/> Service Learning Project <input type="checkbox"/> Registered Apprenticeship				
UNIVERSITY	University/College: University of Virginia								
	Degree or Major: B.S. Engineering								
Number of Articulated CC Credits: 70									

Notes: * The humanities elective requirement can be satisfied by transferable courses with the following prefixed: ARA (Arabic); ART (Art); ENG (Literature Courses only); FRE (French); GER (German); HUM (Humanities); MUS (Music); PHI (Philosophy); REL (Religion); SPA (Spanish); and CST (Communication Studies and Theatre, with the exception of CST 100, 105, and 288)

** The social science elective requirement can be satisfied by transferable courses with the following prefixes ECO (Economics); GEO (Geography); PLS (Political Science); HIS (history); PSY (Psychology); and SOC (Sociology)

John Tyler Community College has signed a Transfer Articulation Agreement with the School of Engineering and Applied Sciences at the University of Virginia. Graduates of JTCC's A.S. in Engineering program with 3.4 grade point averages will meet the transfer requirements to UVA and may pursue their bachelor degrees in engineering by taking distance education courses from UVA offered at JTCC's campuses, or by attending classes in Charlottesville.



Commonwealth of Virginia Plan of Study

Student Name: _____
 School: [Lloyd C. Bird High School](#)
 Date: _____

Cluster: Science, Technology, Engineering & Mathematics Pathway: Engineering & Technology

This Career Pathway Plan of Study can serve as a guide, along with other career planning materials, as learners continue on a career path. Courses listed within this plan are only recommended coursework and should be individualized to meet each learner's educational and career goals. This Plan of Study, used for learners at an educational institution, should be customized with course titles and appropriate high school graduation requirements as well as college entrance requirements.

EDUCATION LEVELS	GRADE	English/ Language Arts	Mathematics	Science	Social Studies/ Science	Other Required Courses Recommended Electives Learner Activities	Recommended Career and Technical Courses Source: Administrative Planning Guide www.doe.virginia.gov/VDOE/ Instruction/CTE/app/	SAMPLE – Occupations Relating to This Pathway: www.doe.virginia.gov/VDOE/ Instruction/CTE/careerclusters/ www.careerclusters.org www.cteresource.org/cpg/
Graduation Requirements: http://www.doe.virginia.gov/2plus4in2004/index.shtml								
MIDDLE	7	1110 English Grade 7	3112 Math Grade 8	4115 Life Science Grade 7	2354 US History: 1877 to Present	6150 Keyboarding or 8461 Inventions & Innovations – 36 Wks	NOTE: Use state course titles 9070/9071 Career Investigation – Phases I & II	<ul style="list-style-type: none"> - Agricultural Engineer/Technician - Application Engineer - Architectural Engineer - Automotive Engineer - Biomedical/Biotechnology Engineer - Chemical Engineer - Civil Engineer - Communications Engineer - Computer Engineer - Computer Hardware Engineer- - Electrical/Electronic/Engineering Technician - Electrical Engineer - Geothermal Engineer - Industrial Engineer/Technician - Manufacturing Engineer/Technician - Marine Engineer - Mechanical Engineer - Metallurgist - Mining Engineer - Nuclear Engineer - Petroleum Engineer - Product/Process Engineer - Systems Engineer
	8	1120 English Grade 8	3131 Algebra I 2-Yr Seq – Part I or 3130 Algebra I or 3143 Geometry	4125 Physical Science Grade 8 or 4210 Earth Science I	2357 Civics & Economics	8462 Technological Systems – 36 Wks	9072 Career Application – Phase III	
<p>Career Assessment: Administration of a career assessment instrument is appropriate at the middle school level to help students and their parents plan for high school (Virginia's Career Planning System or other assessment product).</p>								

EDUCATION LEVELS	GRADE	English/ Language Arts	Mathematics	Science	Social Studies/ Science	Other Required Courses Recommended Electives Learner Activities	Recommended Career and Technical Courses Source: Administrative Planning Guide www.doe.virginia.gov/VDOE/ Instruction/CTE/apg/	SAMPLE – Occupations Relating to This Pathway: www.doe.virginia.gov/VDOE/ Instruction/CTE/careerclusters/ www.careerclusters.org www.cteresource.org/cpg/
SECONDARY	9	1130 English Grace 9	3143 Geometry	4210 Earth Science I or 4310 Biology I	2215 World History & Geography to 1500 AD	Required: 7300 Health & PE Grade 9 7405 Health, PE & Driver Education 5510/5520/5530 Spanish I, II & III or 5310/5320/5330 Latin I, II & III or 5210/5220/5230 German I, II & III or 5110/5120/5130 French I, II & III 8450 Engineering Explorations (9) 8443 Engineering Design & Development – 36 Wks (10) 4612 Local Science Elective - Aerospace Engineering (11) or 8085 Biotechnology Foundations (11) or 8437 Architectural Drawing/Design (11) or 8442 Computer Integrated Manufacturing(11) 8441 Principles of Engineering – 36 Wks (11) 8443 Engineering Design & Development (12) Highly Recommended: 3192 AP Statistics	EN124 – Technical Communications EN170 – Communication CP382 – Computer Programming CP383 –Computer Programming JAVA CP384 – AP Computer Science JAVA CP385 – Independent Study – Computer Science IT100 – Information Technology Fundamentals I IT202 – Keyboarding Application TE 801 – Computing Systems TE501 Communication Technology IT453 – Visual Basic Programming TE301 – Basic Tech Drawing TE302 – Engineering Drawing TE303 – Architectural Drawing TE304 – Advanced Drawing Instruction TE305 – Advanced Engineering Application TE306 – Advanced Architectural Application TE307 – Advanced Architectural Drawing TE308 – Advanced Engineering Drawing TE301 AutoCAD	
	10	1140 English Grade 10 and 6147 Business English	3135 Algebra II	4510 Physics I	2216 World History & Geography: 1500 to Present or 2380 AP World History			
	11	1150 English Grade 11 or 1196 AP Language & Composition	3162 Math Analysis/Pre-Calc or DE 3230 DE Mathematics I - Analysis/Pre-Calc	4410 Chemistry I or 4310 Biology I	2360 Virginia & US History or 2950DE History & Social Science I - Virginia & US History or			
	12	1160 English Grade 12 or 1195 AP English Literature or 1600 DE English I - College Composition	3160 Adv Math - HS Calculus or 3160 Adv Math - DE Calculus 3177 AP Calculus AB	4370 AP Biology or 4470 AP Chemistry or 4270 AP Environmental Science or 4570 AP Physics B or DE4700 DE Science I - Physics	2440 Virginia and US Government or 2951 DE History & Social Science II - Virginia and US Government or 2445 AP US & Virginia Government			
High school courses in the pathway offered locally for college credit should be coded: DE (Dual Enrollment) and/or VC (Validated Credit)								



Commonwealth of Virginia Plan of Study

Student Name: _____
 School: Lloyd C. Bird High School
 Date: _____

Cluster: Science, Technology, Engineering & Mathematics Pathway: Engineering & Technology (continued)

This Career Pathway Plan of Study can serve as a guide, along with other career planning materials, as learners continue on a career path. Courses listed within this plan are only recommended coursework and should be individualized to meet each learner's educational and career goals. This Plan of Study, used for learners at an educational institution, should be customized with course titles and appropriate high school graduation requirements as well as college entrance requirements.

<p>List related certifications/credentials approved by VDOE and offered locally: http://www.doe.virginia.gov/VDOE/Instruction/CTE/apg/ (Go to Certification – License Section) Pre-Engineering Assessment (NOCTI) Virginia Workplace Readiness Assessment (NOCTI) and IC³ Certification (Certiport) Microsoft Office Specialist (MOS) (Microsoft) CAD Assessment (NOCTI) Autodesk Application Certification Program (Autodesk) Pre-Skills Assessment for Mastercam Certification (NOCTI)</p>	<p>Additional Learning Opportunities: CTSO Organization(s): <input type="checkbox"/> DECA <input type="checkbox"/> FBLA <input type="checkbox"/> FCCLA <input type="checkbox"/> FFA <input type="checkbox"/> FEA <input type="checkbox"/> HOSA <input type="checkbox"/> SkillsUSA <input checked="" type="checkbox"/> TSA</p> <p>Work-Based Learning: <input checked="" type="checkbox"/> Career Research <input checked="" type="checkbox"/> Cooperative Education <input checked="" type="checkbox"/> Internship <input checked="" type="checkbox"/> Mentorship <input checked="" type="checkbox"/> Job Shadowing <input checked="" type="checkbox"/> Service Learning Project <input type="checkbox"/> Student Apprenticeship</p>
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Postsecondary: Placement Assessments such as COMPASS & SAT II College Entrance Exams such as ACT & SAT

POSTSECONDARY	SAMPLE POSTSECONDARY PROGRAMS RELATED TO THIS CAREER PATHWAY Individual plans must include locally agreed upon courses at the postsecondary level (See page 2)			
	Pathway	Associate Degree, College Certificate, or Apprenticeship	Bachelors Degree	Postgraduate Degree
		Associate in Applied Science Degree – Mechanical Engineering Technology	Engineering	

College: John Tyler Community College School Division(s): _____

Postsecondary: Placement Assessments such as COMPASS & SAT II

POSTSECONDARY - COMMUNITY COLLEGE or APPRENTICESHIP - Determined Locally	Semester	English	Mathematics	Science	Social Studies	Required Courses or Recommended Electives				
	POSTSECONDARY PLAN OF STUDIES MUST INCLUDE POSTSECONDARY ACADEMIC, CTE, AND OTHER ELECTIVE COURSES APPROPRIATE FOR AN ASSOCIATE DEGREE.									
	Year 1 1 st Semester	ENG111 College Composition	MTH103 Applied Technical Mathematics I			MEC113 Materials & Processes of Industry	DRF151 Engineering Drawing Fundamentals I	ITE115 Intro to Computer Applications & Concepts	SDV100 College Success Skills	
	Year 1 2 nd Semester		MTH104 Applied Technical Mathematics II			MEC195 Introduction to Mechanical Engineering Technology I	DRF152 Engineering Drawing Fundamentals II	DRF241 Parametric Modeling	ELE150 AC & DC Fundamentals	
	Year 2 1 st Semester				Social Science Elective	ELE159 Electric Motors	MEC211 Machine Design I	EGR140 Engineering Mechanics Statics & EGR216 Computer Methods in Engineering & Technology	Health/Physical Education Elective	
Year 2 2 nd Semester			Physical Science Elective *	Humanities Elective	EGR246 Mechanics of Materials	MEC212 Machine Design II	MEC266 Applications of Fluid Mechanics			
College courses offered locally in the high school for college credit should be coded: DE (Dual Enrollment) and/or VC (Validated Credit)										
Related Industry Certifications Available:					Additional Suggested Learning Opportunities:					
					Work-Based Learning: <input type="checkbox"/> Cooperative Education <input type="checkbox"/> Internship <input type="checkbox"/> Mentorship <input type="checkbox"/> Job Shadowing <input type="checkbox"/> Service Learning Project <input type="checkbox"/> Registered Apprenticeship					
UNIVERSITY	University/College: Old Dominion University Degree or Major: Bachelor of Science in Engineering Technology Number of Articulated CC Credits: 68									

Notes:

1. Students planning to transfer to four-year programs should take MTH 116 or MTH 164 in place of MTH103/NTH 104
2. The physical science elective requirement can be satisfied by courses with the following prefixes: BIO, CHM or PHY (recommended BIO 101, BIO 110, CHM 111, PHY 201)
3. The humanities elective requirement can be satisfied by courses with the following prefixed: ARA, ART, CST (with the exception of CST 100, 105, and 228), ENG (literature courses only), FRE, GER, HUM, MUS, PHI, REL, SPA, and SPD (the exception of SPD 100, 105, and 228).
4. The social science elective requirement can be satisfied by courses with the following prefixes: ECO, GEO, HIS, PLS, PSY, or SOC.

The program prepares student to work as technicians in the field of mechanical-electrical manufacturing. Graduates will be able to specific maintenance processes, solve problems in fabrication, and troubleshoot mechanical processes. This program transfers to Old Dominion University.

Course Descriptions

PE 010 ENGINEERING DESIGN – HOW THINGS WORK

One Credit

Engineering Design – How Things Work is a hands-on, project based class that teaches the principles of engineering and engineering technology through examining how everyday objects work. Mechanical, Electrical, Electronic, Fluids systems will be examined with an emphasis on how these systems have shaped our world.

PE011 FOUNDATIONS OF ENGINEERING

One Credit

Foundations of Engineering is a course designed to introduce all first year students to the fundamentals of engineering and the various specialized fields. Students will discover career opportunities, learn to utilize new technologies, and develop essential skills in math, writing, and speaking. Students will complete various engineering projects giving them hands-on experience with design. This course will integrate field trips, guest speakers, lab work, and teamwork to enhance the value of the principles being taught.

PE021 ENGINEERING DESIGN

One Credit

This course is required for all second year students in the Pre-Engineering Specialty Center. It is designed to give students the skills needed to solve engineering problems and to design solutions, ideas, and products. This course will integrate materials, power supplies, teamwork, design processes, and reporting results while solving engineering problems. Field trips, guest speakers, and technology will be included to enhance the value of the principles and skills taught.

PE040 AEROSPACE ENGINEERING

One Credit

Aerospace Engineering will approach the field of Aerospace Engineering with a project-based approach looking at both airplanes and spacecraft. Students will center their studies around something like the design of a plane or space vehicle, the systems involved in the machine, and the scientific aspects of flight. (Projects may change from year to year). Students will apply knowledge of physics and engineering design along with input and research in the field of aerospace engineering to complete the project.

PE042 BIOMEDICAL ENGINEERING

One Credit

Biomedical Engineering will approach the field of Biomedical Engineering with a project-based problem. Students will center their studies solving a problem such as the design of an artificial limb or heart, looking at the mechanics involved in the machine as well as the elements needed on the biology, physiology, and medical side of the design (Projects may change from year to year). Students will apply their knowledge of physics, biology, their knowledge of physics, biology, and engineering design along with input and research in the field of biomedical engineering to complete the project.

PE044 ARCHITECTURAL ENGINEERING

One Credit

3-D Engineering: Drawing and Design will approach the field of 3-D Engineering with a project-based problem, using and expanding concepts learned in Introduction to AutoCAD. Students will center their studies around the design of a building and study the physics, mechanics, and mathematics involved, as well as the aesthetics (Projects may change from year to year). Students will apply their knowledge of physics, geometry, trigonometry, and engineering design, along with input and research in the field of architectural engineering to complete the project. students will also define the difference between an architect and an architectural engineer, thus being able to make an informed career choice.

PE046 MANUFACTURING ENGINEERING Honors

One Credit

Manufacturing Engineering encompasses mechanics, hydraulics, pneumatics, electrical, and systems engineering as well as use of CAD and CNC to solve real-world applications of engineering problems. This is a project-based course with the majority of the work set up as hands-on activities. The student completes specific modules designed to teach the various areas of manufacturing engineering. The second semester challenges students to work as a team and use their newfound knowledge to design and build various projects that will accomplish a task or solve a typical engineering problem.

PE071 JUNIOR SEMINAR

One Credit

Students in the third year of the Pre-engineering program will be required to attend a series of workshops with guest speakers, participate in college visits and field trips. They will log hours for discussion on engineering topics to be decided, and be prepared to complete an independent project and present to classmates, parents, and teachers, etc.

PE072 SENIOR SEMINAR

One Credit

Seminar 2 is a required class for Pre-Engineering students, to be taken in the senior year. This class includes several units of study relevant to college engineering courses. Topics will include Statics, Dynamics, Probability and Statistics, Thermodynamics, Electric Circuit Theory, and Engineering Ethics. Students will see what college-level engineering work is like, and get a little taste of actual lower level courses, while learning to apply what they have learned in their math and science classes.

PE073 JUNIOR MENTORSHIP

One-half Credit

This course is designed for students who wish to participate in the mentorship experience either the summer before their senior year or after school during their senior year. A minimum of 80 hours (two standard work weeks) is required in order to receive half-credit. Students will develop skills in various areas, such as designing projects, solving technical problems, identifying steps in the design process, and evaluating products best suited for the design project.

PE074 SENIOR MENTORSHIP

One Credit

This course is designed for students who wish to participate in the mentorship experience either the summer before their senior year or after school during their senior year. A minimum of 160 hours (four standard work weeks) is required in order to receive full credit. Students will develop skills in various areas, such as designing projects, solving technical problems, identifying steps in the design process, and evaluating products best suited for the design project.

PE110 ENGLISH 10

One Credit

This course is a combination of the traditional English 10 coursework and the principles of technical writing. Technical writing units are integrated into the study of effective communication skills and the fundamental elements of research. American literature is used to emphasize character motivation and human relations.

PE210 WORLD HISTORY through the Eyes of Engineering

One Credit

World History through the Eyes of Engineering incorporates an emphasis on major engineering innovations into the standard World History II course. Students will examine history from 1500 to present day in the context of engineering developments and focus on how those developments shaped world cultures. Many student assignments are related to work done in other engineering courses.

PE212 GOVERNMENT AND ETHICS

One Credit

The curriculum examines the structure and functions of our federal form of government. The decision-making processes at the local, state, national, and international levels are emphasized. The foundations of American government, the politics of American democracy, and constitutional rights and responsibilities are explored in depth. United States political and economic systems are compared to those of other nations, with emphasis on the relationships between economic and political freedoms. Economic content includes the United States market system, supply and demand, and the role of the government in the economy. Democratic values and citizen participation are stressed throughout the course.

PE330 ENGINEERING GEOMETRY

One Credit

Engineering Geometry illustrates the role of the engineer and how geometry is utilized in the problem solving process. This course is a unified study of planes, line congruencies, geometric inequalities, perpendicularity of lines and planes, polygons, polyhedral, area, volume, similarity, coordinate and transformational geometry, circles, and spheres. These units of study are enhanced with a problem solving format that allows for the use of engineering issues to explain these geometric concepts.

PE340 ALGEBRA 2

One Credit

Algebra 2 extends the concepts that students have encountered in previous coursework and provides a thorough treatment of advanced algebraic concepts. Emphasis will be placed on practical applications, logic of procedures, and interpretation of results. Graphing calculators and computers will enhance the students' understanding. Students will be expected to communicate and practice mathematical ideas appropriately. **Pre-requisites: PE330 Geometry**

PE342 ALGEBRA 2/TRIGONOMETRY

One Credit

The design of this course provides students with a more rigorous treatment of Algebra 2 concepts, including a more detailed study of polynomial functions, rational expressions, domain, and range. Rapid pacing allows for the inclusion of major topics in the study of triangle and circular trigonometry as well as conic sections. Frequent opportunities are provided for students to make connections between topics studied and other disciplines. Students routinely use calculators to aid in the problem solving process.

PE430 ENGINEERING BIOLOGY

One Credit

Engineering Biology is a laboratory-based course which encompasses research design concepts, with applications to the fields of engineering, most specifically bio-tech engineering. Core content will include interrelationships in ecosystems, taxonomy, cellular

chemistry, genetics, microbiology, and physiology. These areas are developed within a framework of the principal biological theories with an emphasis on critical thinking and science process skills. Team research projects will be developed using descriptive statistical techniques. Additionally, bio-tech processes will be developed and a research project on this topic will be completed.

PE440 CHEMISTRY & ENGINEERING APPLICATIONS

One Credit

This inquiry-based laboratory course is a comprehensive survey of inorganic and physical chemistry. The course will emphasize problem solving, specifically related to engineering where possible, and provide a thorough foundation for the college bound student, emphasizing a quantitative approach. In addition to learning the concepts of chemistry, students will spend the majority of their time applying their knowledge to new situations and analyzing and evaluating chemical data. Students in this course will continue to learn and practice the skills of experimental design. Research projects will be completed by small teams of students, involving the use of inferential statistics as part of data analysis, and will be focused on engineering problems where appropriate.

PE450 ENGINEERING PHYSICS

One Credit

This is a college preparatory course with emphasis on physical science concepts. Concepts involved include mechanics, thermodynamics, waves, electromagnetism, modern physics, and scientific investigation. Student experiences center around active inquiry and experimentation.

PE469 AP PHYSICS C

One Credit

This course is designed to be equivalent to a freshman college physics course for students planning to major in engineering or physics. It is an intensive and rigorous survey of physical properties. This course surveys the topics of mechanics, and electricity and magnetism with approximately equal emphasis on these two areas. Strong emphasis is placed on solving a variety of challenging problems, requiring calculus. Weekly time equivalent to three hours lecture and four hours laboratory is required. Students will be prepared to sit for the AP Physics C test.

Appendix D: Memorandum of Agreement

Business / Industry Partners who submitted an MOA

Member	Affiliation
Kelly Klanian	Engineer 2 Northrop Grumman
Michael Howell, E. I. T.	Educational Outreach Chair, American Society of Civil Engineers and Structural Engineers Austin, Brockenbrough and Associates, L.L.P.
Melody Moore, Ph.D.	Dean – Division of Professional & Technical Studies John Tyler Community College
Chad Pace	Production Control Supervisor Mazda North American Operations
Duncan Steward, PE	Project Manager MBP, Inc. – McDonough, Bolyard and Peck, Inc.
Bob Stolle	Executive Vice President Core Consulting
Eric Young	Manager – Projects & Service Excellence Bon Secours and St. Francis Medical Center

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1. Identify the needs of the engineering and engineering technology community in Chesterfield County and surrounding areas.
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5. Assist in the internal evaluation process of the program.

CHESTERFIELD COUNTY PUBLIC SCHOOLS AGREES TO:

1. Coordinate the development of the Governor's Career and Technical Academy for Engineering and Engineering Technology Studies.
2. Appoint a program coordinator.
3. Offer courses related to engineering and engineering technology
4. Hire certified teachers for the courses.
5. Conduct on-going evaluation of the program

By signing this memorandum of agreement, I certify that the organization I represent will be a willing participant and support in the development and oversight of the Governor's Career and Technical Academy for Engineering and Engineering Technology.

Kelly A. [Signature]
(Name) [Signature]
(Title) Engineer 2
(Affiliation) Northrop Grumman

12-02-08
Date

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Michael Howell, EIT
Michael Howell, EIT
Education Outreach Chair
American Society of Civil Engineers, Richmond

12-11-2008
Date

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Michael Howell, EIT
Michael Howell, EIT
Structural Engineer
Austin Brockenbrough & Assoc., L.L.P.

12-11-2008
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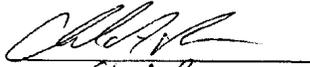
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(Name) Chad Pace
(Title) Production Control Supervisor
(Affiliation) Mazda North American Operations

12/10/08
Date

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Duncan Stewart, PE
Project Manager
MBP Inc

2/16/09
Date

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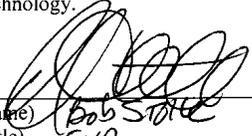
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(Name) Bob Stone
(Title) EVP
(Affiliation) Core Consulting

12/12/08
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William F. Taylor
William F. Taylor
Vice President of Finance and Administration
John Tyler Community College

12/3/08
Date

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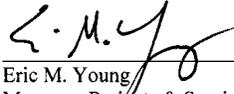
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Eric M. Young
Manager, Projects & Service Excellence
Bon Secours St. Francis Medical Center

12/11/2008

Date

Appendix E: Letter of Assurance from Fiscal Agent

**Governor’s Career and Technical Academy
STATEMENT OF ASSURANCES**

The authorized signature on this page certifies to the Virginia Department of Education that the authorized official assures that:

1. The planning committee has reviewed the provisions of *Administrative Procedures Guide for the Establishment of Governor’s Career and Technical Academies* outlined in the Guidance Manual, and understands that an implementation proposal will need to address these criteria and/or others approved by the Virginia Board of Education.
2. The planning committee agrees to follow the guidelines set forth in the *Administrative Procedures for the Establishment of Governor’s Career and Technical Academies* document.
3. If the Governor’s Career and Technical Academy will be a jointly operated program, an ongoing governing board will be established or maintained to reflect current Board of Education regulations relative to jointly operated schools and programs.
4. A public, government entity will serve as the grant fiscal agent.

Certification by Authorized or Institutional Official:

The applicant certifies that to the best of his/her knowledge the information in this application is correct, that the filing of this application is duly authorized by the partners participating in this process to establish a Governor’s Career and Technical Academy, and that the applicant will comply with the statement of assurances.

Marcus J. Newsome, Ed.D.
Typed or Printed Name of Authorized Official

**Superintendent,
Chesterfield County Public Schools**
Title


Signature of Authorized Official

Date 3-4-09