

**Resolution 2022-2023E**  
**Resolution to Approve New Major, Technology Education, in Bachelor of Science in  
Secondary Education, CTE**

Recommended for approval by the Commission on Undergraduate Studies and Policies

First Reading:

Faculty Senate:

AP Faculty Senate:

Staff Senate:

Undergraduate Student Senate:

Graduate and Professional Student Senate:

Second Reading:

Approved by University Council:

Approved by the President:

First Effective Date to Declare Major: Fall 2024

First Effective Date to Graduate: Spring 2027

**WHEREAS**, Virginia PK-12 schools began the 2021-2022 school year with 3500 teacher vacancies across content areas including Career and Technical Education; and

**WHEREAS**, according to the *2020-2021 Ten Critical Shortage Teaching Endorsement Areas in Virginia* provided by the Commonwealth, Career and Technical Education, is the fourth most in-need licensure area, only behind Elementary Education, Special Education, and Middle Education Grades 6-8; and

**WHEREAS**, there is a high need to produce more technology education teachers in middle and high schools to provide secondary students the technological knowledge needed to feed the pipeline into university programs in STEM fields; and

**WHEREAS**, due to the growth of technology, engineering, and manufacturing-based companies in Virginia and nationwide, there is a critical shortage of qualified workers in STEM (science, technology, engineering, and mathematics) fields; and

**WHEREAS**, the School of Education (SOE) is committed to providing coursework and experiential learning fitting the VT-shaped curriculum to produce licensable graduates with the knowledge, skills, and dispositions of highly qualified PK-12 educators thereby addressing the noted state teacher vacancies; and

**WHEREAS**, no new resources will be required to initiate the new major in Technology Education under the already existing Bachelor of Science in Secondary Education, CTE due to redeveloping existing courses and utilizing current undergraduate initiatives to the maximum extent possible; and

**WHEREAS**, letters of support have been received from all departments whose courses SOE students would take; and

**WHEREAS**, the new major in Technology Education under the Bachelor of Science in Secondary Education, CTE would be an identifiable curriculum that clearly signals the expertise and career focus of educator preparation; and

**WHEREAS**, the new major in Technology Education under the Bachelor of Science in Secondary Education, CTE is anticipated to initially attract 30 students per year interested in pursuing careers in Career and Technical Education, Technology Education; and

**THEREFORE, BE IT RESOLVED THEREFORE**, that the Major in Technology Education be approved for addition to the Bachelor of Science in Secondary Education, CTE degree effective fall of 2024 and forwarded through university governance to the President for approval.

## **New Major Proposal: Technology Education**

### **New Program Documentation**

#### **Need for Program**

The following sections describe the need and value for the development of a new Technology Education teacher preparation program at Virginia Tech.

#### ***Educational Value***

With the growth of technology, engineering, and manufacturing-based companies in Virginia and nationwide, there is a critical shortage of qualified workers in STEM (science, technology, engineering, and mathematics) fields<sup>1</sup>. To create a future workforce capable of filling these positions, students need exposure to learning experiences that create awareness of careers in STEM fields while encouraging and nurturing their technological skills. Students in K-12 settings need exposure to learning experiences that create an awareness of opportunities for pursuing a university degree in a STEM (Science, Technology, Engineering, and Mathematics) field. Exposure to technology and engineering experiences provides the awareness students need to understand the possibility of pursuing a STEM field degree and the skills required to pursue an engineering degree and career, particularly females and those from other underrepresented groups<sup>2</sup>. Preparing students for the future workforce requires highly trained teachers, particularly in STEM fields. Technology education is founded in innovative pedagogies that engage students in authentic project-based activities to develop essential workforce skills (i.e., critical thinking, communication, collaboration, creativity, design-thinking, innovation, etc.). Many of the skills outline in the “Profile of a Virginia Graduate” are beyond just content knowledge. Students need experiences that put content knowledge in the context of real-world applications and authentic problem-solving. The new technology education teacher preparation program will provide a much-needed source of highly qualified teachers to fill a critical need shortage in the Commonwealth of Virginia and nationwide. Virginia Tech is poised to offer this type of program, which will significantly benefit the University and the Commonwealth of Virginia.

#### ***Program/Credit Requirements***

The proposed technology education major will require 120 hours for graduation. Twenty-one of these credits are from defined courses in the core requirements of the Bachelor of Science in Secondary Education. These specific courses are required of all secondary education majors. Forty-five credits are designated as pathway courses. Some of these courses are specifically chosen to meet the Virginia Department of Education’s technology education program requirements; others are given as electives that students can choose from the approved pathway concept course list. The technology education major required courses total 51 credits; this

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<sup>1</sup> Industry Today. (2020, October 22). *Does America Need More STEM Workers?* <https://industrytoday.com/does-america-need-more-stem-workers/>

<sup>2</sup> Bottia, M. C., Stearns, E., Mickelson, R. A., & Moller, S. (2018). Boosting the numbers of STEM majors? The role of high schools with a STEM program. *Science Education Policy*, 102, pp. 85-107.

includes 30 credits of major-specific courses, six credits of breadth electives, and 15 credits of practicum for students' field experiences, leaving three credits for a free elective choice.

### ***Market Analysis***

There is a severe shortage of technology education teachers across the country and in Virginia<sup>3</sup>. Job market data for technology education teachers show a high need nationwide and particularly in Virginia<sup>4</sup>. A search on Indeed.com on March 21, 2021, for “technology education” teachers in Virginia produced 156 results. The Virginia Department of Education listed Career and Technical Education, of which Technology Education is a program, as the 4th most critical area for teacher shortage in 2021-2022<sup>5</sup>. There is a high need to produce more technology education teachers in middle and high schools to provide secondary students with the technological knowledge needed to feed the pipeline into university programs in STEM fields. Currently, Old Dominion University (ODU) is the only other Virginia institution offering a technology education program. ODU's program, however, is focused on occupation studies. In contrast, Virginia Tech's technology education program will focus on engineering, technological problem-solving, and developing highly skilled educators to engage students in the future workforce skills needed for progression into a STEM-related field. Virginia Tech is positioned to be a national leader in producing technology education teachers.

### **Whom Program Will Serve**

The technology education program is expected to enroll approximately 30 students per year. The majority of these students will come from two main demographics. The major avenue for student recruitment will be transfer students from the college of engineering. Nationally, the retention rate for students matriculating from the 1st to 2nd year in an engineering program is just under 80%. The 6-year graduation rate with an engineering degree is under 60%. There are many students at Virginia Tech that are admitted into the College of Engineering as a freshman that do not end up getting an engineering degree. The technology education program will be a very attraction option for students interested in the concept of engineering but do not continue through the engineering program. The other main avenue for recruitment will be from students in northern Virginia. Many secondary schools in the northern Virginia region have technology and engineering programs. Building relationships with the teachers at these schools will provide an effective method for student recruitment directly into the technology education program.

The new technology education program will boost Virginia Tech's presence in the K-12 space. With the new hire of the director of K-12 programs at the Virginia Tech Innovation Campus, the technology education program will be poised for significant contributions to K-12 programs in the northern Virginia region. The technology education program will provide graduates with many different types of job opportunities. Although the primary goal is preparing teacher educators, the skills learned through the technology education program provide students with skills that can translate to many technical positions within industry.

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<sup>3</sup> Moye, J. J., Reed, P. A., Wu-Rorrer, R., & Lecorchick, D. (2020). Current and future trends and issues facing technology and engineering education in the United States. *Journal of Technology Education*, 32(1), pp. 35-49.

<sup>4</sup> Technology Education Teacher National Market Data. Retrieved from [Tech Ed Employment Potential](#)

<sup>5</sup> Virginia Department of Education. *Critical Teaching Shortage Areas in Virginia*. Retrieved from [https://www.doe.virginia.gov/teaching/workforce\\_data/index.shtml](https://www.doe.virginia.gov/teaching/workforce_data/index.shtml)

## **Resources Needed**

Virginia Tech and the School of Education have all of the faculty, classified support, equipment, space, library, and other resources necessary to launch the proposed Technology Education Program.

### ***Faculty***

The program will initially not require any additional faculty resources. Current faculty in the School of Education will initially be able to teach the courses required for the program, including Bradley Bowen, Joseph Mukuni, Natalie Ferand, and Nancy Bradley. One FTE, as a Professor of Practice, will be needed in the 3rd year after program initiation.

### ***Equipment (including computers)***

No new equipment, including computers, is required to initiate the proposed program. For the new full-time hire, no new furniture will be needed. There is ample existing office furniture available for the new faculty member. New computer equipment will be provided for the new hire for \$2,000.

### ***Library***

No new library resources are needed to initiate or sustain the proposed programs. The library has an adequate collection to support the proposed degree programs. Resources include journals and publications for education. Additionally, students and faculty have access to the Virtual Library of Virginia (VIVA), Virginia Tech's ILLiad interlibrary loan services, and the OCLC global library cooperative.

### ***Space***

Additional space is not required to launch the proposed program. There is already adequate classroom and faculty and classified personnel office space. For the new hire, existing office space is available and will be used. In the program's second year, the program coordinator will work with the School of Education Director to establish a plan for purchasing additional equipment.

## **Administration**

The technology education program will be in the School of Education, which is in the College of Liberal Arts and Human Sciences. The anticipated first term for enrollment is summer of 2023. The anticipated first term to graduate is Spring of 2026.

## **Communication**

The Technology Education major will be communicated to current and prospective students through recruitment efforts with the College of Liberal Arts and Sciences (CLAHS). This will include the development of a flyer specific to the major for disbursement, a web page connected to both the School of Education and CLAHS, and promotion at recruiting events including open house and majors fair. Targeted visits to first year experiences courses will also be scheduled to engage with students already accepted to Virginia Tech. Communication with faculty and staff

will include meetings with the designated advisors in teacher education, engineering, engineering education, and other technology focused programs.

### **Additional Justification Based on 15-Day Review Comments**

There is a severe shortage of technology education teachers across the country and in Virginia and the job market data for technology education teachers is very favorable in Virginia. The Virginia Department of Education (VDOE) listed Career and Technical Education (CTE) as the 4th most critical area for teacher shortage in 2021-2022. The VDOE lists seven programs within CTE. Technology Education is one of these programs. VDOE has seven different programs under CTE because each of them has a unique focus and targets different content and populations of teachers and students. The School of Education (SOE) at Virginia Tech currently has three existing concentrations under a CTE major, along with a major in CTE in Agricultural Education. The new major in CTE in Technology Education differs from the other majors in content as outlined by the program requirements and course content outlined by the VDOE. A teacher with a major in Technology Education will be qualified to teach courses at the middle and high school levels that teachers from the other programs will not be qualified to teach.

The new technology education will serve a different market than the other CTE programs in the SOE. Technology education is much more engineering-oriented and prepares students to teach courses that are more focused on engineering and technological design. Students interested in the technology education program will have a significant interest in engineering and desire to participate in hands-on projects. The coursework and experiences students will receive in the technology education program is significantly different than other majors in the SOE's Secondary Education degree. Also, it is anticipated the great majority of students joining the technology education program will be transfer students from other majors across campus and not within the SOE. Therefore, the new technology education degree should not impact enrolment in other SOE majors.

College of Liberal Arts and Human Sciences  
 School of Education  
 Bachelor of Science in Education in Secondary Education  
 Major in Technology Education  
 Checksheet For Students Graduating in The Calendar Year Of 2023

<b>GRADUATION REQUIREMENTS</b>	
<u>Language Study Requirement</u> - Students who do not complete two years of a single foreign or classical language or American Sign Language in high school, may do so by taking six credits of college-level foreign or classical language or American Sign Language. The six credits used to meet this requirement may not be used to satisfy the minimum number of credits required for graduation.	
<u>Credits and GPA</u> – Completion of a minimum of 120 credits with a minimum overall GPA of 2.5; and in-major GPA of 3.0. (In major GPA includes all EDCl, EDCT, EDTE and EDEP courses)	
<u>Additional Requirements</u> – Students must submit passing scores on required state licensure examinations. Students must also complete an industry internship in technology, engineering, or a design-based company and obtain an approved industry credential. <sup>1</sup>	
<u>Prerequisites</u> : Some courses listed on this checksheet may have pre-/co-requisites; please consult the University Course Catalog or check with your advisor.	
<b>SATISFACTORY PROGRESS TOWARD DEGREE</b>	
University Policy 91 <sup>2</sup> requires a student to make satisfactory progress towards a degree. Additionally, licensure programs require that by the time a student has completed 72 credits, they must have passed all licensure examinations, carry an in-major GPA of 3.0, and be accepted into the educator preparation program.	
<b>PATHWAYS TO GENERAL EDUCATION (45 CREDITS)</b>	
<i>*unless otherwise indicated, all courses taken to satisfy Pathways General Education must be taken on an A-F basis</i>	
<b>Concept 1: Discourse (9 credits)</b>	
<b>1f - Foundational</b>	
_____	ENGL 1105 First-Year Writing (3 credits)
_____	ENGL 1106 First-Year Writing (3 credits) Pre: ENGL 1105
<b>1a - Advanced/Applied</b>	
_____	(3 credits)
<b>Concept 2: Critical Thinking in the Humanities (6 credits)</b>	
_____	STS 1504 Intro Science, Tech, Society <sup>3</sup> (3 credits)
_____	(3 credits)
<b>Concept 3: Reasoning in the Social Sciences (6 credits)</b>	
_____	(3 credits)
_____	(3 credits)
<b>Concept 4: Reasoning in the Natural Sciences (6 credits)</b>	
_____	Choose from approved list (3 Credits)
_____	Choose from approved list (3 Credits)
<b>Concept 5: Quantitative and Computational Thinking (9 credits)</b>	
<b>5f - Foundational<sup>4</sup></b>	
_____	MATH 1025 Elementary Calculus (3 credits)
_____	MATH 1026 Elementary Calculus (3 credits) Pre: MATH 1025
<b>5a - Advanced/Applied</b>	
_____	(3 credits)

<sup>1</sup> [https://www.doe.virginia.gov/instruction/career\\_technical/path\\_industry\\_certification/index.shtml](https://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml)

<sup>2</sup> <https://policies.vt.edu/91-eligibility-for-continued-enrollment.pdf>

<sup>3</sup> Can be used for Pathway 2 or 3

<sup>4</sup> Transfer students can substitute MATH 1225 and MATH 1226

<b>Concept 6: Critique and Practice in Design and the Arts (6 credits)</b>	
	<b>6d – Design</b> <sup>5</sup>
_____	EDTE 1004 Introduction to Integrative STEM Education (3 credits)
	<b>6a – Arts</b>
_____	(3 credits)
<b>Concept 7: Critical Analysis of Identity and Equity in the United States (3 credits)</b> <sup>6</sup>	
_____	(3 credits)
<b>BACHELOR OF SCIENCE IN SECONDARY EDUCATION COMMON DEGREE CORE REQUIREMENTS<sup>7</sup> (21 CREDITS)</b>	
_____	EDCI 2574 Social Foundations of Education (3 credits)
_____	EDCI 4554 Educating Exceptional Learners (3 credits) Pre: Jr. Standing
_____	EDCI 4724 Secondary School Teaching Methods I (3 credits) Co: EDCI 3964
_____	EDCI 4734 Adolescent Literacy and Reading (3 credits)
_____	EDCI 4744 Secondary School Teaching Methods II (3 credits) Pre: EDCI 4724. Co: 3964 or EDTE 3964
_____	EDEP 2374 Educational Psychology for PK-12 Teachers (3 credits) Pre: Sophomore standing.
_____	EDEP 3474 Principles and Practices in PK-12 Assessment (3 credits)
<b>MAJOR IN TECHNOLOGY EDUCATION (51 CREDITS)</b>	
_____	CS 1014 Introduction to Computational Thinking (3 credits)
_____	CS 1064 Introduction to Programming in Python (3 credits)
_____	ECE 1004 Introduction to Electrical and Computer Engineering Concepts (3 credits) Pre: ENGE 1215 or ENGE 1414 <sup>8</sup>
_____	EDCT 4624 Managing a Career and Technical Education Program (3 credits)
_____	EDTE 1014 Teaching Technology, Engineering, and Design (3 credits) Pre: EDTE 1004 or ENGE 1215 or ENGE 1414
_____	EDTE 2005 Engineering Technologies (3 credits) Pre: EDTE 1014
_____	EDTE 2006 Engineering Technologies (3 credits) Pre: EDTE 2005
_____	EDTE 2204 Emerging Issues in Technology and Engineering (3 credits) Pre: EDTE 2005
_____	EDTE 3204 Robotics Education (3 credits) Pre: EDTE 2006, CS 1014, CS 1064
_____	EDTE 4204 Capstone in Technology and Engineering Education (3 credits) Pre: EDTE 2204, 3204
<b>Technology Education Breadth Electives (6 credits)</b>	
_____	Choose from approved list
_____	Choose from approved list
<b>Field-Based Requirements (15 credits)</b>	
_____	EDCI 3964 Field Study/Practicum (6 credits; 2 courses at 3 credits each)
_____	EDCI 4964 Field Study/Practicum (9 credits)
<b>FREE ELECTIVE COURSE (3 CREDITS)</b>	

**TOTAL CREDITS 120**

<sup>5</sup> Transfer students can substitute ENGE 1215 Foundations of Engineering (2 credits) or ENGE 1414 Foundations of Engineering Practice (4 credits)

<sup>6</sup> May double-count with another Pathway Concept

<sup>7</sup> unless otherwise indicated, all courses must be taken on an A-F basis; courses satisfying degree core requirements may not be double counted to satisfy other areas of a degree.

<sup>8</sup> Departmental permission (ECE) provided for alternate Pre: MATH 1205 and Co: 1206 for ECE 1004 for non-ECE Majors.



**Approved Courses for Pathway Concept 4: Reasoning in the Natural Sciences (6 credits)**

BIOL 1105 Principles of Biology (3 Credits) **AND** BIOL 1106 Principles of Biology (3 Credits)

**OR**

CHEM 1015 Chemistry in Context (3 Credits) **AND** CHEM 1016 Chemistry in Context (3 Credits)

**OR**

CHEM 1035 General Chemistry (3 Credits) Pre: CHEM 1014 or MATH 1014 or MATH 1025 or MATH 1536 or MATH 1225 or MATH 1214 **AND** CHEM 1036 General Chemistry (3 Credits) Pre: CHEM 1035 or CHEM 1055 or CHEM 1055H

**OR**

PHYS 2205 General Physics (3 credits) Pre: MATH 1016 or MATH 1016H or MATH 1025 or MATH 2015 or MATH 1026 or MATH 1205 or MATH 1205H or MATH 1525 or MATH 1535 or MATH 1225 or MATH 1225H **AND** PHYS 2206 General Physics (3 credits) Pre: PHYS 2305 or 2205

**Approved Technology Education Breadth Electives**

ALCE 3074 Materials and Procedures of Agricultural Construction (3 credits) Pre: Junior standing or instructor permission

ALCE 3084 Agriculture Metal Fabrication (3 credits) Pre: Junior standing or instructor permission

AOE 2664 (ECE 2164) Exploration of the Space Environment (3 credits)

BC 1214 Introduction to Building Construction I (3 credits)

BC 1224 Introduction to Building Construction II (3 credits) Pre: BC 1214

BSE 2094 Introduction to Metal Fabrication (1 credit)

BSE 2484 Engine and Power Train Technology (3 credits) Pre: MATH 1016 or MATH 1025

BSE 3494 Advanced Welding Technology (1 credit) Pre: instructor permission

CS 1114 Introduction to Software Design (3 credits)

CS 2064 Intermediate Programming in Python (3 credits) Pre: CS 1064

ENSC 1015 Foundations of Environmental Science (3 credits)

ENSC 1016 Foundations of Environmental Science (3 credits)

ENSC 3604 Fundamentals of Environmental Science (3 credits) Pre: BIOL 1105 or CHEM 1035

FREC 2004 Forest Ecosystems (3 credits)

FREC 2124 Forests, Society, and Climate (3 credits)

FREC 2554 (LAR 2554) (NR 2554) Leadership for Global Sustainability (3 credits)

MSE 1014 The Science of Materials in Everyday Life (3 credits)



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March 18, 2022

Undergraduate Curriculum Committee Members,

The School of Education is requesting a new major in Technology Education with licensure to be added to the B.S. in Secondary Education Degree. We request your approval of this major to meet the growing demand for teachers in the Commonwealth and especially in Career and Technical Education.

Because the School of Education has already developed the resources and capacity to provide general professional education courses as well as the specialist pedagogy and supervision in the discipline area, we will not immediately need any additional resources to accommodate this major.

Thank you for your consideration,

A handwritten signature in black ink that reads 'Nancy Bradley' in a cursive script.

Nancy Bradley, Associate Director  
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