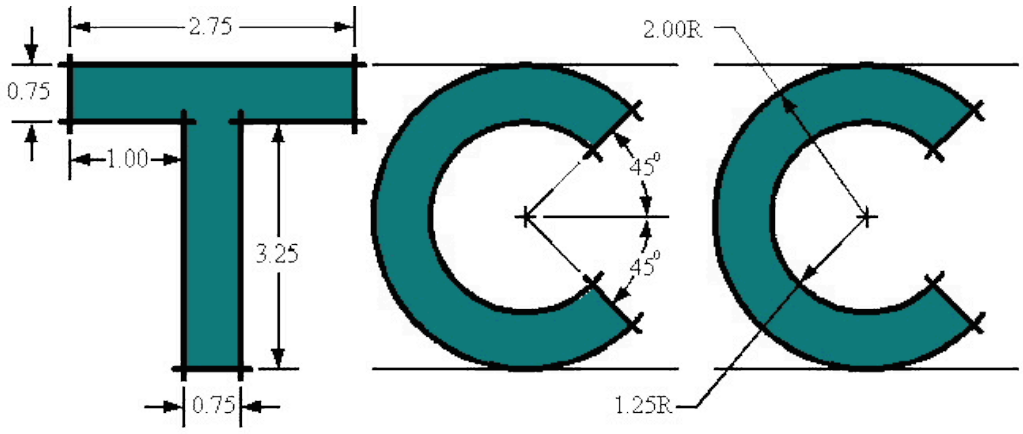

ENGINEERING

Student Handbook

for

ENGINEERING

at

Tidewater Community College
2017 – 2018

For the most recent updates to this handbook, see
www.tcc.edu/faculty/webpages/pgordy/handbook.pdf
Revised: 7-20-17

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Engineering at TCC

The curriculum in Engineering at Tidewater Community College is designed for persons who plan to transfer to a four-year college or university to complete a baccalaureate degree program in one of several fields of engineering such as:

- ***Aerospace Engineering***
- ***Biomedical Engineering***
- ***Civil Engineering***
- ***Chemical Engineering***
- ***Computer Engineering***
- ***Environmental Engineering***
- ***Electrical Engineering***
- ***Industrial Engineering***
- ***Mechanical Engineering***
- ***Mining/Metallurgical Engineering***
- ***Modeling & Simulation Engineering***
- ***Nuclear Engineering***

The curriculum is based on a core of material fundamental to all areas of engineering. This material includes courses which depend heavily on advanced mathematics and sciences applied to engineering fields. The courses offered during this two-year program are very comparable to the first two years of most four-year engineering programs; however, it is essential that students acquaint themselves with the requirements and the curricula of the college or university to which transfer is considered. By obtaining transfer information early, students can avoid later transfer problems such as:

1) Each engineering college may not have programs in all engineering fields. For example, if you wish to major in Chemical Engineering, your choices may be somewhat limited.
2) Certain engineering programs may require freshman and sophomore level courses that are not a part of TCC's Engineering curriculum. In many cases students can make some approved course substitutions in the A.S. degree program in order to transfer as efficiently as possible.
3) Some engineering departments at certain universities may require a higher GPA than others.

Transfer information has been provided in this booklet for Old Dominion University (ODU) and for Virginia Polytechnic Institute and State University (Virginia Tech) since most TCC Engineering students transfer to these universities. A table of transfer options for colleges in Virginia has also been included. TCC students may also wish to consult with the TCC Counseling Center in planning their programs and selecting electives.

For additional information regarding the Engineering program at TCC, contact:

Paul Gordy, Associate Professor & Engineering Program Head, Virginia Beach Campus
Office: H-115 (ATC) Phone: 822-7175 Email: PGordy@tcc.edu
Paul Gordy's Home Page: http://faculty.tcc.edu/PGordy/

Kenny Grimes, Associate Professor – Engineering, Virginia Beach Campus
Office: H-118 (ATC) Phone: 822-7278 Email: KGrimes@tcc.edu

Ed Morris – Engineering Instructor, Virginia Beach Campus
Office: H-118 (ATC) Phone: 822-7042 Email: EMorris@tcc.edu

William Simmons – Assistant Professor Engineering, Chesapeake Campus
Office: Room 403-F (CT-2) Phone: 822-5259 Email: WSimmons@tcc.edu

Dr. Swati Chokshi – Associate Professor Engineering, Chesapeake Campus
Office: Room 403-F (CT-2) Phone: 822-5258 Email: SChokshi@tcc.edu

Selecting an Engineering Discipline

Many factors are involved in choosing an Engineering discipline in which to specialize. Some students have a definite area of preference before they begin their college education, while other students may have difficulty selecting a discipline. Since most Engineering programs are quite similar in the freshman year, students have some time in which to make this decision. Although the sophomore years of most Engineering programs are somewhat similar, there are often some discipline-specific courses required so it is to the students advantage to select a discipline or at least begin to narrow the choices. The junior year of any Engineering program will be almost completely discipline-specific, so all students should have selected an Engineering discipline by the end of their sophomore year. When students transfer from TCC into a four-year Engineering program they will need to apply for transfer into a specific Engineering department.

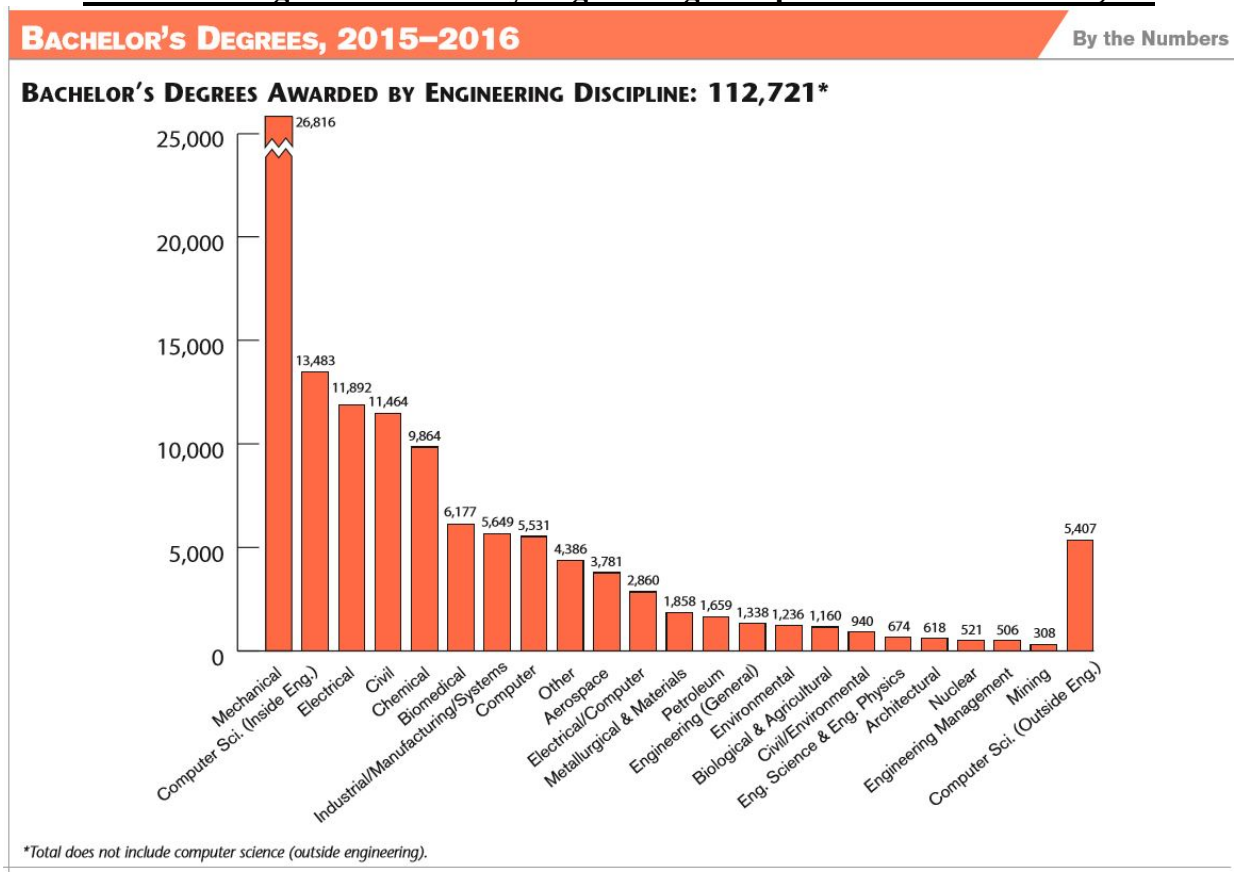
Some possible factors in selecting an Engineering discipline are listed below.

- Work experience in a related area
- Personal preference/strengths/aptitude
- Local employment opportunities
- Salary
- Nationwide demand for specific types of engineers
- Engineering disciplines available at local universities
- Work environment

Starting salaries for recent graduates with Bachelor's degrees in Engineering are consistently quite high. The tables on the following page shows average starting salaries for specific disciplines.

To a large extent, the law of supply and demand seems to control how many potential Engineers enter each discipline. If jobs were not available in a particular area of Engineering, the number of students entering that discipline would certainly begin to decrease. The chart below indicates how many BS degrees in Engineering were awarded by discipline in 2015-2016 (Source: Profiles of Engineering and Engineering Technology Colleges – ASEE 2016 Edition).

Bachelor's Degrees Awarded By Engineering Discipline in 2015-2016: 112,721



Engineering Salary by Discipline

Discipline	Starting Salaries *	Mid-Career Salary *
Aerospace (AE)	$65,400	$106,000
Biomedical (BI)	$62,700	$104,000
Chemical (CH)	$69,800	$119,000
Civil (CV)	$57,200	$96,300
Computer Engr. (CP)	$69,600	$113,000
Computer Science	$63,500	$111,000
Electrical (EE)	$67,000	$110,000
Environmental (EN)	$53,900	$92,800
Industrial (IN)	$63,800	$104,000
Materials (MT)	$62,700	$99,500
Mechanical (ME)	$63,500	$103,000
Nuclear (NU)	$68,500	$116,000
Petroleum (PT)	$96,700	$172,000

* 2015-2016 PayScale College Salary Report: http://www.payscale.com/college-salary-report/majors-that-pay-you-back/bachelors?page=23

Engineering Salary by Length of Experience

Years Experience	Average Salary (for all engineers)
< 1	$55,500
1 - 2	$55,675
3 - 4	$65,000
5 - 9	$73,082
10 - 14	$84,131
15 - 19	$98,797
20 - 24	$112,000
25 or more	$121,000

Reference: NSPE 2013 Engineering Income and Salary Survey

According to the 2013 NSPE Engineering Income & Salary Survey:

- The average annual salary for an engineer with a BS degree is $84,380.
- The average annual salary for an engineer with a MS degree is $91,250.
- The average annual salary for an engineer with a PhD degree is $108,707.
- The average annual salary for a licensed Professional Engineers (PE) is $92,000 (the average increases up to $117,200 when combined with other licenses).

Engineering or Engineering Technology?

Students considering a major in Engineering should understand the difference between Engineering and Engineering Technology. Some colleges or universities, such as ODU, offer programs in both Engineering and Engineering Technology. Other colleges or universities, such as Virginia Tech, UVA, and VCU offer only Engineering programs. In 2016 ASEE provided data on:

- 296 colleges and universities offering BS degrees in Engineering
- 61 colleges offering BS degrees in Engineering Technology
- Not all colleges and universities participate in this survey, but it gives a good representation.

(Source: Profiles of Engineering and Engineering Technology Colleges – ASEE 2016 Edition).

In general, Engineering is a more rigorous program mathematically, providing a better foundation for design work, research, and post-graduate study (Master's or Ph.D. degrees). Engineering graduates are typically offered higher salaries and will have a wider assortment of employment opportunities than Engineering Technology graduates, although in some cases they may do the same work. Engineers typically have the lead role in engineering projects such as new product development, engineering design work or analysis, production management, consulting, etc., whereas Engineering Technologists often work in more of an engineering support capacity.

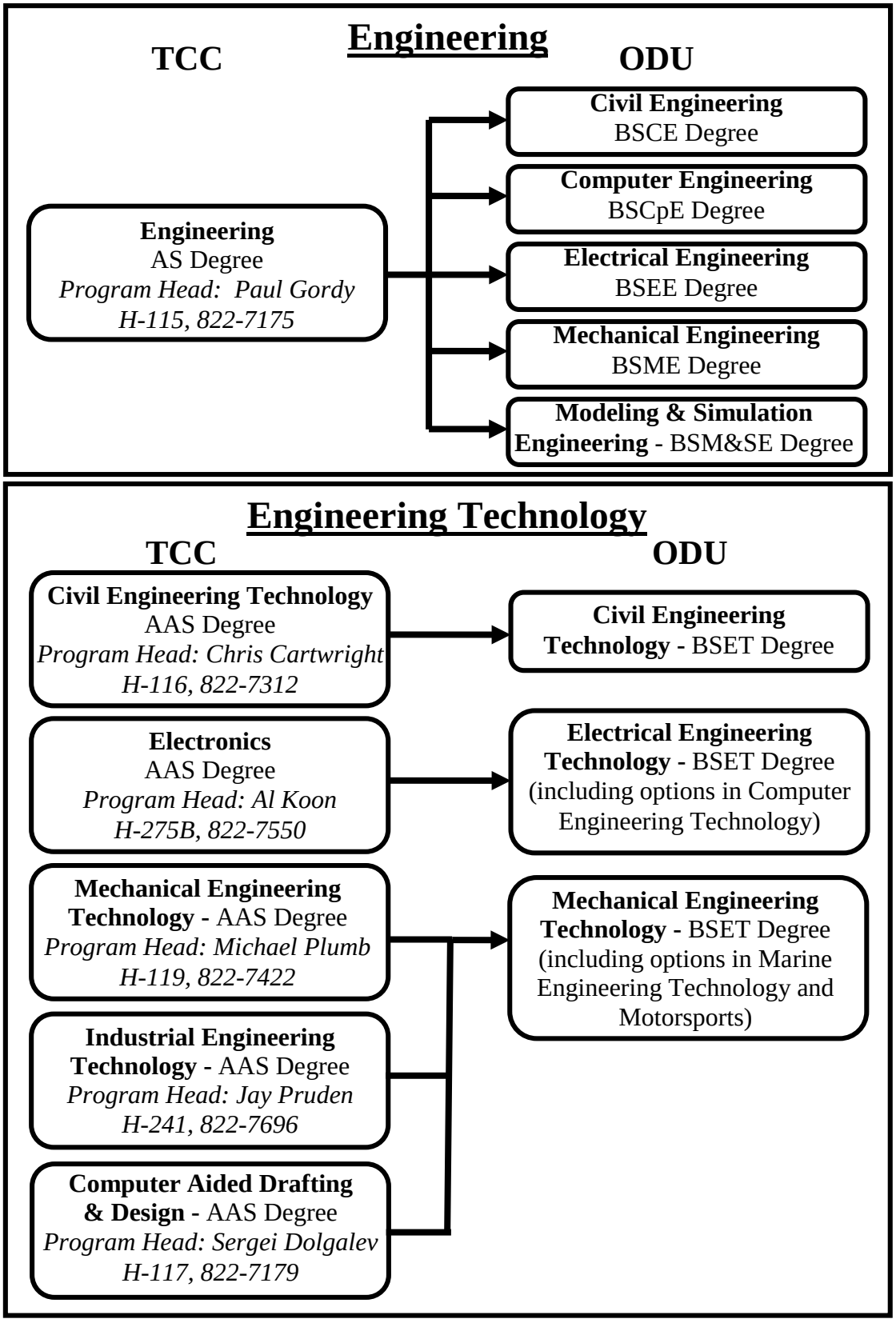
Engineering Technology is typically more "hands on" oriented and students in these curricula may spend much more time in lab courses than Engineering students. Engineering Technologists often work closely with Engineers, but in a supportive role such as in quality assurance, prototype model construction and testing, safety, reliability assessment, design modification, and production (although Engineers may work in these areas as well). Students majoring in Engineering Technology should realize that some companies will not hire graduates with Engineering Technology degrees (such as NASA) and hire only applicants with Engineering degrees for Engineering positions. Other companies make no distinction between the degrees. The federal government (Norfolk Naval Shipyard, NAVSEA, Naval Public Works, etc.) will often hire Engineering Technology graduates as engineers once they pass the Fundamentals of Engineering (FE) exam. Post-graduate programs in Engineering Technology are rare and Engineering Technology students are typically required to take many undergraduate math and engineering courses before they will be accepted into postgraduate Engineering programs.

Students sometimes take courses in Engineering Technology programs and then wish to use the credits in an Engineering program. This is generally not possible. ABET accredits both Engineering and Engineering Technology programs nationwide and differences in content typically makes it unlikely for Engineering programs to give credit for Engineering Technology courses.

As stated previously, Virginia Tech offers only Engineering programs. ODU offers both Engineering programs (with 5 undergraduate degrees) and Engineering Technology programs (with 3 undergraduate degrees). The chart on the following page indicates how different programs at TCC transfer to ODU.

Engineering and Engineering Technology

Transfer Relationship between TCC and ODU



ENGINEERING (831)

Associate in Science Degree: Engineering (2015-2016 Catalog)

Also see the TCC Catalog: http://www.tcc.edu/academics/transfer-degrees/programs/engineering-degree

Pre-requisite (P)/ Co-requisite (C)	Course Number	Course Title	Credits	When Taken
		FIRST SEMESTER		
P: MTE 9 or placement in MTH 163/166	CHM 111	College Chemistry I	4	_____
P: MTH 164 or 166	EGR 110	Engineering Graphics	3	_____
P: MTH 164 or 166	EGR 120	Introduction to Engineering	2	_____
Placement	ENG 111	College Composition I	3	_____
Placement	MTH 173	Calculus with Analytic Geometry I	5	_____
_____	SDV 101	Orientation to Engineering and Technologies	1	_____
		Total:	**18**	
		SECOND SEMESTER		
P: CHM 111	CHM 112	College Chemistry II ****	4	_____
P: ENG 111	ENG 112/131	College Composition II/Technical Writing***	3	_____
P: MTH 173	MTH 174	Calculus with Analytic Geometry II	4	_____
P: EGR 110 and EGR 120 or instructor perm.	EGR 125	Introduction to Engineering Methods (C++)	4	_____
_____	HIS ____	History (HIS 101,102, 111,112,121, or 122)	3	_____
		Total:	**18**	
		THIRD SEMESTER		
P: MTH 174	MTH 279	Ordinary Differential Equations	4	_____
P: MTH 173	PHY 241	University Physics I	4	_____
	EGR	Approved Engineering Elective *	3	_____
_____	_____	Humanities Elective **	3	_____
_____	_____	Social Science Elective **	3	_____
		Total:	**17**	
		FOURTH SEMESTER		
P: MTH 174	MTH 277	Vector Calculus	4	_____
P: PHY 241	PHY 242	University Physics II	4	_____
_____	EGR	Approved Engineering Elective *	3	_____
_____	EGR	Approved Engineering Elective *	3	_____
_____	_____	Health, Physical Education or Recreation	1	_____
_____	_____	Humanities Elective **	3	_____
		Total:	**18**	
		Total Minimum Credits for A.S.degree:	**71**	

Notes related to the A.S. degree in Engineering shown on the previous page

*__Approved Engineering Electives__ include the following courses (consult the Engineering Program Head for assistance in determining which courses are recommended for transfer into Civil Engineering, Mechanical Engineering, Electrical Engineering, etc.). A minimum of 9 credits of Approved Engineering Elective are required for the degree; however, additional courses may still be transferable.

EGR 140 - Engineering Mechanics - Statics (3 cr, co-requisite MTH 174, pre-requisite EGR 120)
EGR 218 - Introduction to Modeling & Simulation (3 cr, pre-requisite MTH 174 and EGR 125, co-requisite of MTH 243)
EGR 230 - Discrete Event Simulation (4 cr, pre-requisites EGR 218 and MTH 243)
EGR 245 - Engineering Mechanics - Dynamics (3 cr, pre-requisite EGR 140, pre-requisite MTH 174)
EGR 246 - Mechanics of Materials (3 cr, pre-requisite EGR 140)
EGR 247 - Mechanics of Materials Lab (1 cr, co-requisite EGR 246)
EGR 262 - Fundamental Circuits Lab (2 cr, pre-requisites EGR 271 and EGR 125)
EGR 270 - Fundamentals of Computer Engineering (4 cr, pre-requisite EGR 125)
EGR 271 - Circuit Theory I (3 cr, co-requisites MTH 279 and EGR 110)
EGR 272 – Circuit Theory II (3 cr, pre-requisites EGR 271 and MTH 279)

** **Social Science/Humanities Electives.**
Eligible courses are listed page 35 in the 2017-2018 catalog - http://www.tcc.edu/forms/catalog/
Students should consult an academic advisor or counselor or the Engineering Program Head to choose the appropriate course(s). A table of general areas for each elective is provided below.

Social Science Electives	Humanities Electives
ECO 201, 201	Art (history or appreciation only): ART 101,102,201, 202
GEO 210, 220	Drama/Theater: CST 130, 141,151,152,229
HIS 101, 102, 111, 112, 121, 122	Foreign Languages (maximum of one): CHI 101, 102; FRE 101,102, 203, 204; GER 101, 102, 201, 202; RUS 101, 102, 201, 202; SPA 101, 102, 203, 204, ASL 125
PLS 211, 212, 241	HUM 201, 202, 241, 246, 256, 259, 260
PSY 200, 201, 202	Literature: ENG 125, 211, 212, 241, 242, 243, 244,251,252,253,254
SOC 200, 201, 202, 211	Music (history or appreciation only): MUS 121, 122, 221, 222
	Philosophy – PHI 101, 102, 111, 115, 220, 226
	Religion – REL 200, 210, 230

*** **ENG 112 is recommended for students transferring to Virginia Tech and most universities. ENG 131 is recommended for students transferring to ODU, although ENG 112 is acceptable.**

**** Virginia Tech no longer requires CHM 112 for any engineering majors except chemical engineering. TCC students planning to transfer to Virginia Tech may substitute any other 4 credits not being used for the AS degree in Engineering in place of CHM 112. See Paul Gordy in H-115 to complete an official substitution form.

Approved Engineering Electives

The TCC Engineering curriculum sheet on the previous two pages includes nine credits of "Approved Engineering Electives". Students should select a **minimum** of nine credits of Engineering courses in order to satisfy this requirement. Factors to consider when selecting Approved Engineering Electives include:

- Students should pick courses that will allow them to transfer efficiently into the Engineering program of their choice at a 4-year college or university
- Students can sometimes benefit by taking more than nine credits of Approved Engineering Electives if all of the credits transfer

Since most TCC Engineering students transfer to either Old Dominion University or Virginia Tech, a table is provided below with recommended selections for Approved Engineering Electives. Additional transfer information for these institutions is provided later in this handbook.

Recommended Approved Engineering Electives (minimum of 9 required)

ODU Civil Engineering		ODU Mechanical Engineering		ODU Electrical Engineering		ODU Computer Engineering		ODU Modeling, Simulation & Visualization Engineering	
Electives	**Cr**	**Electives**	**Cr**	**Electives**	**Cr**	**Electives**	**Cr**		
EGR 140	3	EGR 140	3	EGR 271	3	EGR 271	3	EGR 218	3
EGR 245	3	EGR 245	3	EGR 272	3	EGR 272	3	EGR 230	4
EGR 246	3	EGR 246	3	EGR 262	2	EGR 262	2	CSC 210	4
GOL 105 or BIO 101	4	EGR 247	1	EGR 270	4	EGR 270	4		
				EGR 140	3	CSC 210	4	(Also sub MTH 243 for MTH 277)	

VA Tech Chemical Engineering		VA Tech Civil Engineering		VA Tech Mechanical Engineering		VA Tech Electrical Engineering		VA Tech Computer Engineering		VA Tech All Others **	
Electives	**Cr**	**Electives**	**Cr**	**Electives**	**Cr**	**Electives**	**Cr**	**Electives**	**Cr**	**Electives**	**Cr**
CHM 241	3	EGR 140	3	EGR 140	3	EGR 140*	3	EGR 140*	3	EGR 140	3
CHM 245	2	EGR 245*	3	EGR 245	3	EGR 271	3	EGR 271	3	EGR 245	3
CHM 242	3	EGR 246	3	EGR 246	3	EGR 272	3	EGR 272	3	EGR 246	3
CHM 246	2	GOL 105	4			EGR 270	4	EGR 270	4		

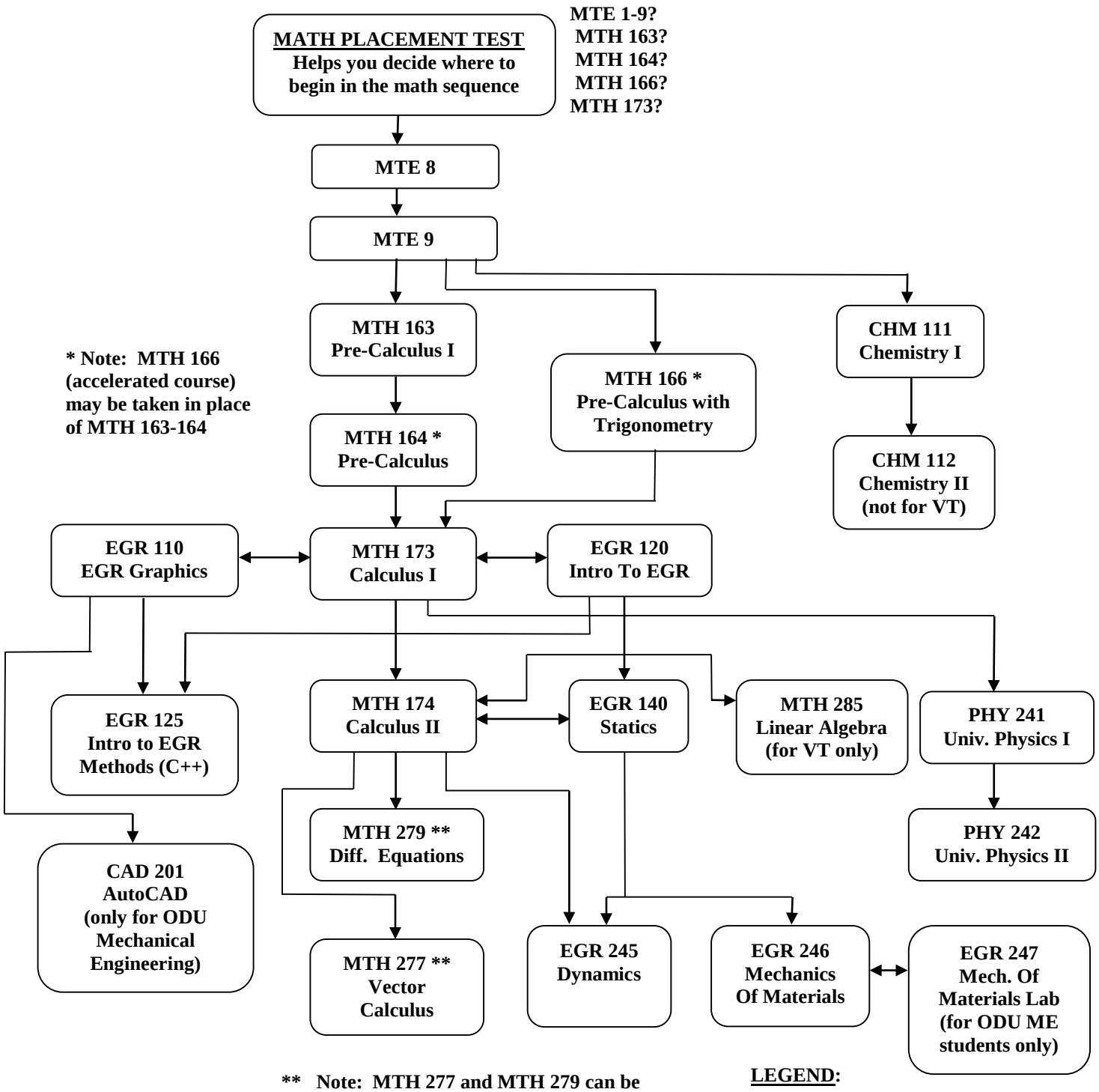
* Satisfies required Engineering & Science elective at Virginia Tech (see the ***check sheet*** for each department on Virginia Tech's web site): http://www.registrar.vt.edu/undergraduate/checksheets/

** Includes the following (see the ***check sheet*** for each department on Virginia Tech's web site for more information):

- Aerospace Engineering
- Ocean Engineering
- Biological Systems Engineering
- Engineering Science & Mechanics
- Industrial & Systems Engineering
- Material Science
- Mining & Minerals Engineering

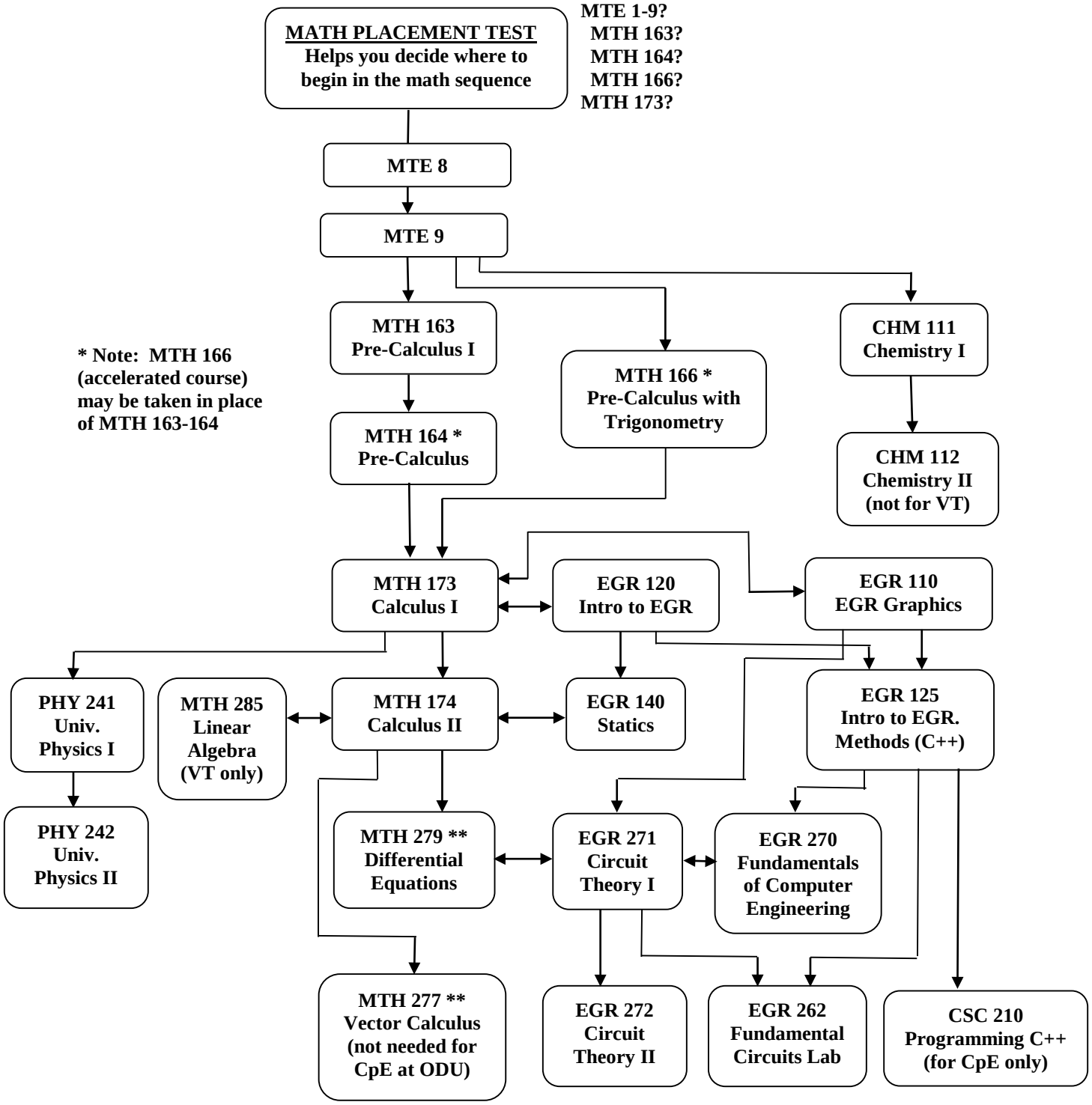
Flowchart of Technical Courses for
Engineering Students Transferring into

Civil or Mechanical Engineering



Flowchart of Technical Courses for
Engineering Students Transferring into

Electrical or Computer Engineering



**** Notes:**

A) MTH 277 and MTH 279 can be taken in either order after MTH 174

B) MTH 277 not required for Computer Engineeringat ODU

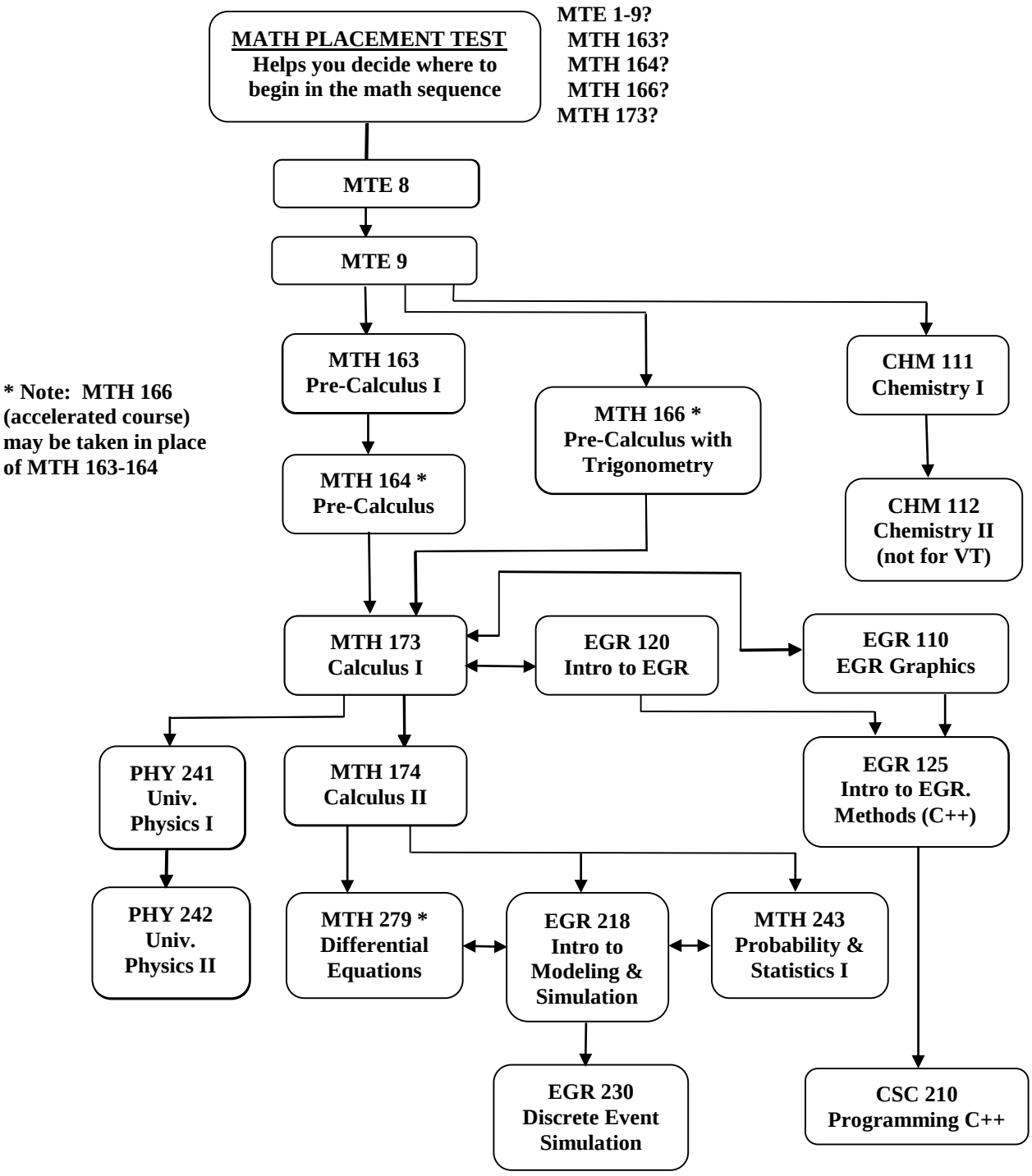
LEGEND:

Indicates a pre-requisite

Indicates a co-requisite

Flowchart of Technical Courses for
Engineering Students Transferring into

Modeling, Simulation, and Visualization Engineering



*** Note: MTH 277 not required for Modeling, Simulation and Visualization Engineering at ODU**

LEGEND:

Indicates a pre-requisite

Indicates a co-requisite

Tentative Annual Schedule of Engineering Courses

Course	Fall		Spring		Summer	
	Va Beach Campus	Ches Campus	Va Beach Campus	Ches Campus	Va Beach Campus	Ches Campus
EGR 110 - Engineering Graphics	D/E	D/E	D/E	D/E	D/E	D/E
EGR 120 - Introduction to Engineering	D/E/H	D/E	D/E	D/E	D/E	D/E
EGR 125 - Introduction to Engineering Methods (C++)	D/E	D/E	D/E	D/E	D/E	D
EGR 140 - Engineering Mechanics – Statics	D/E	D/E	D/E	D/E	D/E	E
EGR 218 - Introduction to Modeling & Simulation	E					
EGR 230 - Discrete Event Simulation			E			
MTH 243 – Probability and Statistics I	E					
EGR 245 - Engineering Mechanics – Dynamics	D/E	D	D/E	D	E	
EGR 246 - Mechanics of Materials	E	D/E	D	D/E		E
EGR 247 - Mechanics of Materials Laboratory	D	D	D	D/E		E
EGR 271 - Circuit Theory I	E	D	D	E	D	E
EGR 272 - Circuit Theory II	D	E	E	D		
EGR 262 - Fundamental Circuits Lab	D	E	D	E	E	
EGR 270 - Fundamentals of Computer Engineering	E	E	D	E	E	

Key:

D - denotes a daytime class meeting between 8:00 - 4:00 p.m.
E - denotes an evening class meeting between 4:00 - 9:55 p.m.
H - denotes hybrid class (mostly internet-based class with some required meetings on campus)
* - typically also offered each semester at either the Chesapeake Campus or the Tri-Cities Center

Tri-Cities Center: Most EGR courses offered at Tri-Cities are at the request of Newport News Shipbuilding. As a result, it is difficult to predict which courses will be offered on a given semester. However, the following courses will be offered occasionally: EGR 110, 120, 125, 140, 245, 246, 247, 270, and 271. The courses will be typically offered only during the day on Tuesdays and Thursdays. Contact William Simmons at WSimmons@tcc.edu for more information.

Scholarships

The following scholarships are available for engineering students. See the Engineering Program Head for additional information.

Name of Scholarship	General Information and Requirements	Amount	Deadline
Transfer Grant	Program in Virginia law to award grants to VCCS students completing Associate's degrees and transferring to 4-year Virginia colleges and universities. Find more details at: https://www.vawizard.org/wizard/transferGrant	$2000 annually for up to 3 years	Upon application to 4-year college
Michael J. French, Jr. Memorial Engineering Scholarship	Established in 2005 by the TCC Engineering Club in honor of Michael J. French, Jr., an outstanding student who passed away in 2004. The scholarship is intended to support excellent students in pursuing careers in engineering through TCC's Engineering program. For more information: https://tcc.academicworks.com/opportunities/619 Minimum GPA 3.0 Must have completed MTH 173 and EGR 120 or equiv.	$1500	April 1
Virginia Community College STEM Scholarship	This scholarship is given to encourage talented Virginia Community College students to pursue studines in technical fields, engineering, and the sciences. Awards are generally made for full-time students although part time students are also eligible. Only available us US citizens. Minimum GPA 3.0 For more information: http://vsgc.odu.edu/sf/ccstem/	$2000	March 15
Stihl Scholarship	Established by STIHL, Inc. to further strengthen their partnership with Tidewater Community college through the advancement of student development in the fields of advanced manufacturing, including Mechtronics, Engineering Technology, and/or Engineering. For more information: https://tcc.academicworks.com/opportunities/643	$5000	April 1
Society for Women Engineers Scholarship	The Hamton Roads Section of SWE awards scholarships for women enrolled in engineering transfer programs. For more information: http://www.hr-swe.org/scholarships	$1000	June 1
Leo Padis Scholarship	This scholarship is available only for students transferring to Virginia Tech and completing the A.S. degree in Engineering from a Virginia Community College. Merit based. Several scholarships awarded annually. http://eng.vt.edu/academics/undergraduate-students/scholarships-for-prospective-students.html	$1000	June 1

(continued)

Departmental Scholarships	Transfer scholarships are offered by the following ODU departments: - ***Civil and Environmental Engineering Department*** - ***Modeling, Simulation, and Visualization Engineering*** Contact each department for additional information. Other engineering departments may also offer scholarships.	varies	when transferring
Other Scholarships	Scholarships are often available through engineering societies, military-related organizations, credit unions, and other organizations.	varies	varies

Internships

Many engineering companies hire students while they are in college through internships or cooperative education. Students earn significant salaries as they work either part-time or full-time (on alternating semesters) or during the summer. Internships give students valuable experience to put on their resumes and often lead to offers of full-time employment upon graduation.

Name of Scholarship	**General Information and Requirements**
Virginia Commonwealth STEM Industry Internship Program (CSIIP)	With the support of the Commonwealth of Virginia, the Virginia Space Grant Consortium (VPGS) has created the Commonwealth Industry Internship Program (CSIIP) to help link STEM students to paid internships throughout Virginia. http://csiip.spacegrant.org/
NAVSEA (Norfolk Naval Shipyard)	Naval Sea Systems Command (includes Norfolk Naval Shipyard and other facilities) Internship Program http://www.navsea.navy.mil/Home/Warfare-Centers/Career-Opportunities/Internships/
Dominion Energy	Dominion Energy – Scholarships, Interships, Cooperative Education https://www.dominionenergy.com/community/educational-programs
Norfolk Southern	Norfolk Southern – Cooperative Education and Internships http://www.nscorp.com/content/nscorp/en/work-at-ns/career-paths/co-ops-and-interns.html
NASA Langley	NASA has several programs, including LARSS (Langley Aerospace Research Student Scholars) http://www.nasa.gov/larc/for-students-higher-ed/#.VZ3nQ_lVhBc
Jefferson Lab	https://www.jlab.org/div_dept/admin/HR/jobline/student.html
TCC Career and Employment Services	Job listings, job fairs, employment workshops, and more. Stop by B-112 or visit https://www.tcc.edu/student-services/career-services-center
USAJobs	The Federal Government has taken steps to help students and recent graduates join the Federal service. New opportunities will appear on USAJOBS as agencies post them. https://www.usajobs.gov/studentsandgrads
Other internships	Consider contacting local engineering companies for internship opportunities

ENGINEERING

TCC has student clubs at two campuses related to engineering:

- **TCC Engineering Club** – Virginia Beach Campus (Advisor: Paul Gordy, pgordy@tcc.edu)
- **STEM Club** – Chesapeake Campus (Advisor: Bill Simmons, wsimmons@tcc.edu)

The TCC Engineering Club and the STEM Club are very active student clubs that can greatly enhance the educational experience for Engineering students. Club activities include:

- Field Trips to local business/industry/colleges
- Engineering speakers from business/industry
- Presentations by 4-year Engineering colleges
- National ASEE robotics competition
- Social activities
- Regular meetings
- Design contests
- Service projects

These clubs also offers students leadership opportunity. Club officers and committee members are involved in planning field trips, speakers, contests, and more.

Virginia Beach Campus: Meetings are generally scheduled on Tuesdays and/or Thursdays from 12:30 to 1:30, but check with the club advisor or engineering instructors for more information. The club meets in room H-179 (Advanced Technology Center) during the Fall and Spring semesters. Join the ***TCC Engineering Club's Blackboard site*** to receive emails about upcoming club activities and to get access to club projects, job postings, scholarship information, photos from club events, etc. To join the club Blackboard site, send an email (***from your TCC email account***) to any club officer or to Paul Gordy, Engineering Club Advisor, at PGordy@tcc.edu .

Chesapeake Campus: Contact Bill Simmons (WSimmons@tcc.edu) for more information.

Surry Nuclear Power Plant field trip

Rosemont Road Cleanup Project

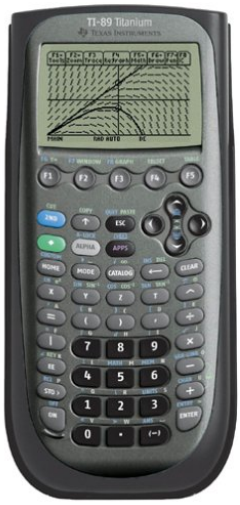
Field trip to Virgina Tech

ASEE Model Design (robotics) Competition

Calculator Recomendation for Engineering Students

It is recommended that Engineering students purchase one of the following calculators:

TI-89
Titanium



HP Prime
Graphing Calculator

TI-nspire CX CAS
(be sure that it is the CAS model)

Note:
- The TI-nspire CX CAS is similar to the TI-89
- The TI-nspire CX (not a recommended choice) is similar to the TI-84 and does include many powerful features in the CAS model.

Instructors will not actually check to see what type of calculator that the students are using. However, students should realize that they may be at a disadvantage to other students on a test if they have a calculator with lesser capabilities. Some of the features which separate these calculators from others are listed below:

- Solution of simultaneous equations (including complex coefficients)
- Vector operations (such as dot and cross products)
- Determination of roots of polynomials
- Algebraic operations involving complex numbers
- Unit conversions
- Symbolic calculations
- Integration and differentiation
- Programming capabilities
- Graphing

Computer Recommendation for Engineering Students

TCC Engineering students are not required to own computers. Computer labs are available in various locations on campus for student use:

- H-151, H-164, H-179 and H-209 in the ATC on the VB Campus
- Room 409 (on a limited basis) and in the LRC at the Chesapeake Campus
- Rooms 1105 and 1109 at the Tri-Cities Center

Nearly all Engineering courses require significant computer use, so it is advantageous to have your own computer. Check with Engineering faculty for further recommendations.

Transfer Options for TCC Engineering Students in Virginia

TCC is accredited by the Southern Association of Colleges and Schools (SACS). TCC students can easily transfer credits to other colleges nationwide. Listed below are Engineering programs in Virginia which students may want to consider for continuing their Engineering education. Each college or university sets their own transfer requirements, so students should contact the college of their choice early in their program to check on transfer details. Detailed engineering transfer information for Old Dominion University and Virginia Tech is also provided later in this booklet.

College or University	Engineering programs offered	Comments
Old Dominion University	Civil Engineering Computer Engineering Electrical Engineering Mechanical Engineering Modeling & Simulation Engineering	• Guaranteed acceptance with 2.5 GPA • Foreign Language requirement waived • General Education requirements met by AS degree in Engineering. • More information later in this handbook
Virginia Tech	Aerospace Engineering, Biological Systems Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Computer Science (within Engineering), Electrical Engineering, Engineering Science & Mechanics, Industrial & Systems Engineering, Material Science Engineering, Mechanical Engineering, Mining & Minerals Engineering, Ocean Engineering	• VCCS Guaranteed Admission Agreement (GAA) with 3.2 GPA and completion of A.S. degree in Engineering (EGR). • GAA is available online at: https://www.tcc.edu/academics/degrees/transfer/transfer-agreements • General Education requirements (University Core Curriculum 1-7) automatically met by AS degree in EGR. • More information later in this handbook
Christopher Newport Univ.	Computer Engineering	3.0 GPA
Hampton University	Chemical Engineering Computer Engineering Electrical Engineering	Private University so more expensive Only Chemical Engineering program in the Tidewater area
George Mason University	Applied Computer Science BioEngineering Civil & Infrastructure Engineering Computer Engineering Computer Science Cyber Security Engineering Electrical Engineering Information Technology Mechanical Engineering Systems Engineering	2.85 GPA required for transfer See VCCS transfer guide at: https://admissions.gmu.edu/transferGuide/ VCCS General Articulation Agreement - http://admissions.gmu.edu/documents/transferGaaVCCS.pdf
Norfolk State University	Electrical & Electronics Engineering Optical Engineering Mechanical Engineering (added soon)	2.0 GPA (3.0 GPA for combined BS/MS program)
Virginia Commonwealth University	Biomedical Engineering Chemical and Life Science Engineering Computer Engineering Computer Science (within Engineering) Electrical Engineering Mechanical & Nuclear Engineering	3.0 GPA VCCS General Articulation Agreement - http://ugrad.vcu.edu/pdfs/GAA_Engineering_VCCS.pdf
University of Virginia	Aerospace Engineering, Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Science, Computer Engineering, Electrical Engineering, Engineering Science, Mechanical Engineering, Systems Engineering	Guaranteed admission to all engineering programs with 3.4 GPA and completion of A.S. degree. VCCS General Articulation Agreement - https://admission.virginia.edu/vccsguide
James Madison University	General Engineering	3.0 GPA, VCCS Gen. Articulation Agreement - http://www.jmu.edu/transfer/VCCStransfer/GAA.shtml
Virginia State University	Computer Engineering Manufacturing Engineering Computer Science (within Engineering)	Minimum 2.0 GPA for transfer
Virginia Military Institute	Civil & Environmental Engineering Electrical Engineering Mechanical Engineering	Minimum 3.2 GPA for transfer Must be 22 years old or younger

Old Dominion University Transfer Information

Admission:

Students should apply online at: www.odu.edu
The deadlines for transfer admission are as follows:

Fall or Summer admission: March 15 recommended, but check www.odu.edu
Spring admission: October 1

Students must indicate on their application which degree program they wish to pursue. Students who complete their A.S. degree in Engineering from TCC with a minimum GPA of 2.5 are automatically accepted into the Engineering department of their choice. Transfer credit will only be given for courses in which the student received a grade of C or better. Official copies of TCC transcripts must be sent at the time of application and again once all coursework at TCC has been completed. Engineering department personnel generally will not counsel students or provide specific transfer information until the student has applied for admission to ODU.

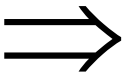
Notes:

1) Many TCC students transfer to ODU ***before*** completing their A.S. degree (often taking courses at both colleges in the same semester). If this occurs, simply let your ODU advisor know that you plan to complete the A.S. degree and your records will be evaluated such that you will receive the benefits of completing the degree.
2) Once you have been accepted, contact the departmental advisor for an appointment. Do not wait until the Preview session for transfer students. It is important to register as soon as possible in order to get into the engineering classes that you need.

General Information for all Engineering Programs at ODU:

1. ODU offers five engineering degree programs (also shown in the chart on page 7):
   Electrical Engineering **Civil Engineering** **Mechanical Engineering**
   Computer Engineering **Modeling & Simulation Engineering**
2. There are at least ***three significant advantages*** to completing the A.S. degree in Engineering at TCC before transferring to ODU:
   A) The foreign language requirement is waived ***if the student completes*** the A.S. degree in Engineering from TCC.
   B) Scholarships are sometimes available for transfer students ***if the student completes*** the A.S. degree in Engineering. This includes the ***Transfer Grant*** listed in the Scholarships section of this handbook.
   C) The lower-level General Education requirements at ODU are automatically met ***if the student completes*** the A.S. degree in Engineering from TCC. This gives the student great flexibility in that general education courses transfer as a block and do not need to match on a course-by-course basis. This is illustrated in the diagram shown below.

TCC General Education Courses	
Course	**Cr.**
History Elective	3
Social Science Elective	3
Humanities Science Elective	3
Humanities Science Elective	3
Total Credits:	12



ODU General Education Courses	
Course	**Cr.**
Interpreting the Past	3
Human Behavior	3
Human Creativity	3
Literature	3
Total Credits:	12

3. ODU recently added a public speaking course, COMM 101R, to each of their engineering programs. It is recommended that TCC engineering students take CST 100 to satisfy this requirement.

ODU Electrical Engineering
Transfer Information

Transferring to ODU's Electrical Engineering Program:

1. Once you have applied and received a letter of acceptance contact the Electrical and Computer Engineering (ECE) office at 683-3741 for an appointment for transcript evaluation, registration, and questions.

2. See the ODU Electrical Engineering Curriculum Worksheet on the following page.

3. The Electrical Engineering curriculum at ODU contains 4 sophomore-level electrical/computer engineering courses and students should have all 4 of these courses in order to move smoothly into the junior-level electrical engineering courses. All 4 of these courses can be taken at TCC as indicated by the chart below. Be sure to check the Annual Schedule on page 13 since each course is not offered every semester at TCC.

TCC Course Number and Title	TCC Credits	ODU Course Number	ODU Credits
EGR 271 Circuit Theory I	3	ECE 201	3
EGR 272 Circuit Theory II	3	ECE 202	3
EGR 262 Fundamental Circuits Lab	2	ECE 287	2
EGR 270 Fundamentals of Computer Enginering	4	ECE 241	4

3. Take EGR 140 – Statics as it transfers to ODU as a required non-major Engineering elective.
4. Take CST 100 – Public Speaking for additional transfer credit.

Overall Recommendation:

1. Take the 4 electrical courses listed above as **Approved Engineering Electives** at TCC (although a minimum of only 9 credits are needed for the A.S. degree at TCC).
2. Complete the A.S. degree in Engineering at TCC.
3. Take EGR 140 – Statics for additional transfer credit.
4. Take CST 100 – Public Speaking for additional transfer credit.

Additional transfer information is available at TCC's and ODU's web sites:

ODU Electrical & Computer Engineering Home Page: http://www.odu.edu/ece
ODU Curriculum Sheets for VCCS Students: https://www.odu.edu/academics/programs/curriculum-sheets
TCC Transfer Information: http://tcc.edu/academics/degrees/transfer/transfer-agreements

ODU Electrical Engineering Transfer Worksheet (Unofficial)

(BSEE Degree: 2015-16 Catalog)

ODU Course #	ODU Course Title	Cr	√	Transfer Credit from TCC
ENGL 110C	English Composition	3		ENG 111
MATH 211	Calculus I	4		MTH 173
CHEM 121N/122N	Chemistry I and Chemistry Lab	4		CHM 111
ENGN 110	Engineering & Tech I	2		EGR 120
COMM 101R	Public Speaking	3		CST 100
MATH 212	Calculus II	4		MTH 174
CS 150	Intro to Programming	4		EGR 125
CHEM 123N	Chemistry II	3		CHM 112
PHYS 231N	University Physics I	4		PHY 241
ECE 111	Information Literacy for ECE	2		EGR 110
ECE 201	Circuit Analysis	3		EGR 271
GEN ED	Interpreting the Past	3		A. S. Degree *
MATH 307(280)	Differential Equations	3		MTH 279
PHYS 232N	University Physics II	4		PHY 242
ECE 241	Fund of Computer Engineering	4		EGR 270
ECE 202	Circuits, Signals & Linear Sys.	3		EGR 272
ECE 287	Circuits Lab	2		EGR 262
ENGN Elective	Non-major Engineering Elective	3		EGR 140
MATH 312 (285)	Calculus III	4		MTH 277
ENGL 231C	Technical Writing	3		ENG 131
ECE 303	Electrical Power	3		
ECE 313	Electronic Circuits	4		
ECE 332	Micro. Materials & Processes	3		
GEN ED	Human Creativity	3		A. S. Degree *
ECE 302	Linear Systems	3		
ECE 304	Probability, Statistics & Reliability	3		
ECE 387	Microelec. Fabrication Lab	3		
ECE 381	Discrete Time Signal Processing	3		
GEN ED	Literature	3		A. S. Degree *
ECE 323	Electromagnetics	3		
ECE 485W	EE Design I	3		
ECE 486	Prep ECE Design II	1		
ECE 4XX	ECE Technical Elective	3		
ECE 4XX	ECE Technical Elective	3		
Depth	Upper Division Gen Education	3		
ENMA 480	Engineering Ethics	3		
ECE 487	ECE Design II	2		
ECE 4XX	ECE Technical Elective	3		
ECE 4XX	ECE Technical Elective	3		
GEN ED	Human Behavior	3		A. S. Degree *
Depth	Upper Division Cluster or Minor	3		
	Total credits in B.S. degree:	**127**		**Max Total Transfer Credits: 74**

Note: The ODU Foreign Language Requirement is waived if the A. S. Degree has been completed.

* If the A.S. Degree is completed, the 12 credits of TCC General Education requirements transfer as a block to cover the 12 credits of ODU General Education requirements (see chart on page 20).

ODU Computer Engineering
Transfer Information

Transferring to ODU's Computer Engineering Program:

1. Once you have applied and received a letter of acceptance, contact the Electrical and Computer Engineering (ECE) office at 683-3741 for an appointment for transcript evaluation, registration, and questions.
2. See the ODU Computer Engineering Curriculum Worksheet on the following page.
3. The Computer Engineering curriculum at ODU contains 4 sophomore-level electrical/computer engineering courses and students should have all 4 of these courses in order to move smoothly into the junior-level electrical engineering courses. All 4 of these courses can be taken at TCC as indicated by the chart below. Be sure to check the Annual Schedule on page 13 since each course is not offered every semester at TCC.

TCC Course Number and Title	TCC Credits	ODU Course Number	ODU Credits
EGR 271 Circuit Theory I	3	ECE 201	3
EGR 272 Circuit Theory II	3	ECE 202	3
EGR 262 Fundamental Circuits Lab	2	ECE 287	2
EGR 270 Fundamentals of Computer Enginering	4	ECE 241	4

4 The Computer Engineering program at ODU requires 2 computer science courses (based on the language C++). These 2 courses can be taken at TCC as indicated by the chart below.

TCC Course Number and Title	TCC Credits	ODU Course Number	ODU Credits
EGR 125 Intro to Engineering Methods or CSC 201 Computer Science I	4 4	CS 150	4
CSC 210 Programming C++	4	CS 250	4

Note: Some students take CSC 110 before CSC 201 if they would like a slower introduction into programming concepts using C++. CSC 110 at TCC is equivalent to CSC 148 at ODU, but these courses are not required and most engineering students do not take them.

5. The Computer Engineering program is the only Engineering program at ODU ***does not require*** TCC's MTH 277. It is recommended that you substitute CSC 210 in place of MTH 277 for graduation purposes at TCC. A waiver is required for this substitution. See Paul Gordy in H-115 for the waiver.
6. Take CST 100 – Public Speaking for additional transfer credit.

Overall Recommendation:

1. Take the 4 Electrical/Computer Engineering courses listed in the first table above as **Approved Engineering Electives** at TCC (although a minimum of only 9 credits are needed for the A.S. degree at TCC).
2. Take the 2 Engineering/Computer Science courses listed in the second table above.
3. Do not take MTH 277 at TCC (obtain a waiver to replace it with CSC 210 or with additional Approved Engineering Electives).
4. Complete the A.S. degree in Engineering at TCC.
5. Take CST 100 – Public Speaking for additional transfer credit.

Additional transfer information is available at TCC's and ODU's web sites:

ODU Electrical & Computer Engineering Home Page: http://www.odu.edu/ece
ODU Curriculum Sheets for VCCS Students: https://www.odu.edu/academics/programs/curriculum-sheets
TCC Transfer Information: http://tcc.edu/academics/degrees/transfer/transfer-agreements

ODU Computer Engineering Transfer Worksheet (Unofficial)

(BSCpE Degree: 2015-16 Catalog)

ODU Course #	ODU Course Title	Cr	√	Transfer Credit from TCC
ENGL 110C	English Composition	3		ENG 111
MATH 211	Calculus I	4		MTH 173
CHEM 121N/122N	Chemistry I and Chemistry Lab	4		CHM 111
ENGN 110	Engineering & Tech I	2		EGR 120
COMM 101R	Public Speaking	3		CST 100
MATH 212	Calculus II	4		MTH 174
CS 150	Intro to Programming	4		EGR 125
CHEM 123N	Chemistry II	3		CHM 112
PHYS 231N	University Physics I	4		PHY 241
ECE 111	Information Literacy for ECE	2		EGR 110
ECE 201	Circuit Analysis	3		EGR 271
PHYS 232N	University Physics II	4		PHY 242
GEN ED	Literature	3		A. S. Degree *
MATH 307 (280)	Differential Equations	3		MTH 279
ECE 241	Fund of Computer Engineering	4		EGR 270
ECE 202	Circuits, Signals & Linear Sys.	3		EGR 272
ECE 287	Circuits Lab	2		EGR 262
CS 381	Discrete Structures	3		
CS 250	Problem Solving & Programming	4		CS 210
CS 252	Intro to UNIX	1		ITN 171 (4 cr)
ENGL 231C	Technical Writing	3		ENG 131
ECE 313	Electronic Circuits	4		
ECE 302	Linear Systems	3		
ECE 341	Digital System Design	3		
CS 361	Adv. Data Structures	3		
GEN ED	Human Creativity	3		A. S. Degree *
ECE 304	Probability, Statistics & Reliability	3		
ECE 346	Microcontrollers	3		
CS 350	Software Engineering	3		
ECE 381	Discrete Time Signal Processing	3		
ECE xxx	ECE Technical Elective	3		
ECE 484W	CMEN Design I	3		
ECE 443	Computer Architecture	3		
ECE 486	Prep ECE Design II	2		
ENMA 480	Engineering Management	3		
ECE 4xx	ECE Technical Elective	3		
GEN ED	Interpreting the Past	3		A. S. Degree *
ECE 487	ECE Design II	2		
CS 471	Operating Systems	3		
ECE 4xx	ECE Technical Elective	3		
GEN ED	Human Behavior	3		A. S. Degree *
ECE 4xx	ECE Technical Elective	3		
	Total credits in B.S. degree:	**128**		**Max Total Transfer Credits: 72**

Note: The ODU Foreign Language Requirement is waived if the A. S. Degree has been completed.

* If the A.S. Degree is completed, the 12 credits of TCC General Education requirements transfer as a block to cover the 12 credits of ODU General Education requirements (see chart on page 20).

ODU Mechanical Engineering
Transfer Information

Transferring to ODU's Mechanical Engineering Program:

1. Once you have applied and received a letter of acceptance, contact the Academic Advisor for Mechanical Engineering and Mechanics (MEM), at 683-6363, for an appointment for transcript evaluation, registration, and questions.
2. See the ODU Mechanical Engineering Curriculum Worksheet on the following page.
3. Students transferring to ODU can take CAD 201 (AutoCAD) for additional transfer credit beyond the A.S. degree in Engineering. CAD 201 (4 cr) will transfer to ODU as MET 120 – Computer Aided Engineering Graphics as shown on the transfer worksheet on the following page. Note that EGR 110 is a pre-requisite to CAD 201.
4. Students transferring to ODU will lack MEM 201 and MEM 203 (Material Science and Lab), but these courses are not prerequisites for most junior level courses and can easily fit into your schedule at some point once you transfer to ODU.
5. Take CST 100 – Public Speaking for additional transfer credit.

Overall Recommendation:

1. Take EGR 140, EGR 245, EGR 246, and EGR 247 at **Approved Engineering Electives** at TCC.
2. Complete the A.S. degree in Engineering at TCC.
3. Take CAD 201 for additional transfer credit.
4. Take CST 100 for additional transfer credit.

Additional transfer information is available at TCC's and ODU's web sites:

ODU Mechanical Engineering Home Page: http://www.odu.edu/mae
ODU Curriculum Sheets for VCCS Students: https://www.odu.edu/academics/programs/curriculum-sheets
TCC Transfer Information: http://tcc.edu/academics/degrees/transfer/transfer-agreements

ODU Mechanical Engineering Transfer Worksheet (Unofficial)

(BSME Degree: 2015-16 Catalog)

ODU Course #	ODU Course Title	Cr	√	Transfer Credit from TCC
ENGN 110	Freshmen Engr. & Technology I	2		EGR 120
MATH 211	Calculus I	4		MTH 173
CHEM 121N/122N	Chemistry I and Chemistry Lab	4		CHM 111
ENGL 110C	English Composition	3		ENG 111
COMM 101R	Public Speaking	3		CST 100
CHEM 123N	Chemistry II	3		CHM 112
MATH 212	Calculus II	4		MTH 174
CS 150	Problem Solving & Programming I	4		EGR 125
PHYS 231N	University Physics I	4		PHY 241
MAE 111	Information Literacy & Research	2		EGR 110
MET 120	Computer Aided Drafting	3		CAD 201
MAE 201	Material Science	3		
MAE 203	ME Lab 1 - Materials	1		
MAE 204	Statics	3		EGR 140
PHYS 232N	University Physics II	4		PHY 242
MATH 312 (285)	Calculus III	4		MTH 277
MAE 205	Dynamics	3		EGR 245
MAE 220	Egr. Mech. II - Solid Mechanics	3		EGR 246
MAE 225	ME Lab II - Solid Mechanics	1		EGR 247
MATH 307 (280)	Differential Equations	3		MTH 279
ENGL 231C	Technical Writing	3		ENG 131
GEN ED	Interpreting the Past	3		A. S. Degree *
MAE 311	Thermodynamics I	3		
MAE 303	Fluid Mechanics	3		
MAE 305	ME Lab III - Thermo/Fluids	1		
MAE 340	Computational Methods in ME	3		
GEN ED	Human Creativity	3		A. S. Degree *
GEN ED	Literature	3		A. S. Degree *
MAE 312	Thermodynamics II	3		
MAE 332	Mechanical Engineering Design I	3		
MAE 315	Heat and Mass Transfer	3		
ENGN 401	Fund. of Engineering (FE) Review	1		
GEN ED	Human Behavior	3		A. S. Degree *
ENMA 480	Ethics & Philosophy in Engineering	3		
MAE 434W	Project Design and Management I	3		
MAE 433	Mechanical Engineering Design II	3		
MAE 436	Dynamic Systems and Control	3		
MAE Option	ME Option ** Senior Elective	3		
GEN ED	Upper Division/Cluster	3		
MAE 435	Project Design and Management II	3		
MAE Option	ME Option ** Senior Elective	3		
MAE Option	ME Option ** Senior Elective	3		
GEN ED	Upper level cluster/minor	3		

Total credits in B.S. degree: 126 **Max Total Transfer Credits: 72**

Note: The ODU Foreign Language Requirement is waived if the A. S. Degree has been completed.

* If the A.S. Degree is completed, the 12 credits of TCC General Education requirements transfer as a block to cover the 12 credits of ODU General Education requirements (see chart on page 20).

** ME students must declare 1 of 2 possible options or declare a minor before taking ME Options. See next page.

Options and Minors for ODU Mechanical Engineering Students

Upon completion of the first semester of the junior year, ODU Mechanical Engineering students must pick one of the two options or specializations shown below or pick one of the minors listed below. Note on the previous page that several senior courses are listed as "ME Option". Those courses must be chosen from the list of courses provided below for the option/minor selected. Additional restrictions may apply.

- Option (or concentration) in ***Power/Energy***
- Option (or concentration) in ***Mechanical Systems/Design***
- Option (or concentration) in ***AeroSpace Engineering***

Minors (for all ODU engineering disciplines)

Students can also elect to obtain a minor. Minors have the advantage of also satisfying the upper-division General Education requirement. The number of courses required for each minor varies. Some restrictions apply.

Minors include:

- Minor in ***AeroSpace Engineering***
- Minor in ***Motorsports Engineering***
- Minor in ***Biomedical Engineering***
- Minor in ***Civil Engineering***
- Minor in ***Civil Engineering Technology - Construction***
- Minor in ***Computer Engineering***
- Minor in ***Cyber Security***
- Minor in ***Electrical Engineering***
- Minor in ***Electrical Engineering Technology***
- Minor in ***Energy Engineering***
- Minor in ***Engineering Management***
- Minor in ***Environmental Engineering***
- Minor in ***Global Engineering***
- Minor in ***Marine Engineering***
- Minor in ***Mechanical Engineering***
- Minor in ***Mechanical Engineering Technology***
- Minor in ***Military Leadership***
- Minor in ***Modeling & Simulation***

Reference:
http://catalog.odu.edu/undergraduate/frankbattencollegeofengineeringandtechnology/minorsbattencollege/

ODU Civil Engineering Transfer Information

ODU does not offer a separate BS degree in ***Environmental Engineering***. Students that wish to focus on environmental engineering can still specialize in the environmental area by selecting related electives in this area. Students can also continue for MS or PhD degrees in either Civil or Environmental Engineering. Note ODU's approach is that same approach found at many universities, including Virginia Tech.

The Civil Engineering program at ODU allows students to specialize in various disciplines within Civil Engineering, including:

- Geotechnical
- Structural
- Water Resources
- Environmental
- Transportation

Transferring to ODU's Civil Engineering Program:

1. Once you have applied and received a letter of acceptance, contact the Civil and Environmental Engineering Department office at 683-3753 for an appointment for transcript evaluation, registration, and questions.
2. ODU does not require EGR 247 (Mechanics of Materials Lab) for the Civil Engineering program, but TCC Engineering faculty recommend that students take it anyway. Taking the lab (EGR 247) along with the course (EGR 246) gives the student practical experience in experiments involving the mechanics of materials.
3. Students may take GOL 105 or BIO 101 as additional transfer credit to satisfy the Science Elective in ODU's CE curriculum. In most cases, GOL 105 is recommended.
4. Students may also take CIV 171 (Surveying I - 3 credits) at TCC in place of CET 319 (Surveying - 1 credit) at ODU for additional transfer credit beyond the A. S. degree. This is not a good match in terms of the number of credits, but still may be a good option for some students.
5. Take CST 100 – Public Speaking for additional transfer credit.

Overall Recommendation:

1. Take EGR 140, EGR 245, and EGR 246 as **Approved Engineering Electives** at TCC.
2. Complete the A.S. degree in Engineering at TCC.
3. Take GOL 105 or BIO 101 for additional transfer credit.
4. Consider taking EGR 247.
5. Consider taking CIV 171 at TCC in place of CET 319 at ODU.
6. Take CST 100 – Public Speaking for additional transfer credit.

Additional transfer information is available at TCC's and ODU's web sites:

ODU Civil Engineering Home Page: http://www.odu.edu/cee
ODU Curriculum Sheets for VCCS Students: https://www.odu.edu/academics/programs/curriculum-sheets
TCC Transfer Information: http://tcc.edu/academics/degrees/transfer/transfer-agreements

ODU Civil Engineering Transfer Worksheet (Unofficial)

(BSCE Degree: 2015-16 Catalog)

ODU Course #	ODU Course Title	Cr	√	Transfer Credit from TCC
ENGN 110	Freshman Engineering & Technology I	2		EGR 120
CHEM 121N/122N	Chemistry I and Chemistry Lab	4		CHM 111
ENGL 110C	English Composition	3		ENG 111
GEN ED	Human Creativity	3		A. S. Degree *
MATH 211	Calculus I	4		MTH 173
CS 150	Intro to Programming	4		EGR 125
CHEM 123N	Chemistry II	3		CHM 112
MATH 212	Calculus II	4		MTH 174
PHYS 231N	University Physics I	4		PHY 241
CEE 111	Information Literacy & Research	2		EGR 110
Science Elect.	BIO 110N/111N or OEAS 111N	4		BIO 101 or GOL 105 (GOL preferred)
MATH 312 (285)	Calculus III	4		MTH 277
CEE 204	Statics	3		EGR 140
PHYS 232N	University Physics II	4		PHY 242
COMM 101R	Public Speaking	3		CST 100
CEE 220	Mechanics of Deformable Bodies	3		EGR 246
CEE 219	Surveying for Engineers	1		CIV 171
GEN ED	Literature	3		A. S. Degree *
MATH 307 (280)	Differential Equations	3		MTH 279
ENGL 211C	English Composition	3		ENG 131
MAE 205	Dynamics	3		EGR 245
CEE 304	Probability, Statistics, and Risk CE	3		
CEE 350	Environmental Pollution & Control	3		
CEE 330	Hydromechanics	3		
CEE 305	C & E Engineering Computations	3		
CEE 320	Civil Engineering Materials	3		
CEE 323	Soil Mechanics	3		
CEE 340	Hydraulics & Water Resources	3		
CEE 335	CEE Soils & Hydraulics Lab	1		
CEE 240	Geographic Information Systems	3		
GEN ED	Interpreting the Past	3		A. S. Degree *
CEE 310	Structural Engineering I	3		
CEE 410	Concrete Design I	3		
ENGN 401	Fund. of Engineering (FE) Review	1		
CEE 430	Foundation Engineering	3		
CEE 470	Transportation Engineering	3		
CEE 402	Professional Practice Engineering	1		
GEN ED	Gen Ed Upper Level Requirement 1	3		
GEN ED	Human Behavior	3		A. S. Degree *
CEE 4XX	Transp. Or Environ Engr. Elective	3		
CEE 4XX	Civil Engineering Elective	3		
GEN ED	Gen Ed Upper Level Requirement 2	3		
ENMA 480	Ethics & Philosophy in Engr. Apps.	3		
CEE 403W	Civil Engineering Design Project	3		
	Total credits in B.S. degree:	**130**		**Max Total Transfer Credits: 73**

Note: The ODU Foreign Language Requirement is waived if the A. S. Degree has been completed.

* If the A.S. Degree is completed, the 12 credits of TCC General Education requirements transfer as a block to cover the 12 credits of ODU General Education requirements (see chart on page 20).

ODU Modeling & Simulation Engineering Transfer Information

What is Modeling & Simulation Engineering?

The following excerpt is from ODU's website:

"*The MSVE Department offers an undergraduate four-year degree program leading to the Bachelor of Science in Modeling and Simulation Engineering (BS-M&SE). The department also offers programs of graduate study leading to the degrees Master of Engineering, Master of Science, Doctor of Engineering, and Doctor of Philosophy with a major in Modeling and Simulation. The department's academic programs are coupled with a strong department research program conducted jointly with researchers from the Virginia Modeling, Analysis and Simulation Center (VMASC). Research activities range from investigation of fundamental modeling and simulation methods and technologies to applications of modeling and simulation in the domains of medicine and health care, transportation, education and gaming, science and engineering, homeland security and defense, and business enterprise decision support.****"***

Transferring to ODU's Modeling, Simulation and Visualization Engineering Program:

1. Once you have applied and received a letter of acceptance, contact the Academic Advisor for the program at 683-3720, for an appointment for transcript evaluation, registration, and questions.
2. See the ODU Modeling, Simulation and Visualization Engineering Curriculum Worksheet on the following page.
3. Take three new courses that TCC has recently developed for this program:
   - EGR 218 – Intro to Modeling & Simulation (3 cr) transfers to ODU as MSIM 201(3 cr)
   - EGR 230 – Discrete Event Simulation (4 cr) transfers to ODU as MSIM 205 (3 cr) and MSIM 281 (1 cr)
   - MTH 243 – Probability & Statictics (3 cr) transfers to ODU in place of STAT 330 (3 cr)
4. Take CSC 210 (4cr) in place of MTH 277 as ODU does not require this MTH 277 for this program.
5. Take CST 100 – Public Speaking for additional transfer credit.

Overall Recommendation:

1. Take EGR 218, EGR 230, and MTH 243 as **Approved Engineering Electives** at TCC.
2. Complete the A.S. degree in Engineering at TCC.
3. Take CSC 210 (4cr) in place of MTH 277. Contact Paul Gordy to complete a Course Substitution form.
4. Take CST 100 – Public Speaking for additional transfer credit.

Additional transfer information is available at TCC's and ODU's web sites:

ODU Modeling, Simulation & Visualization Engineering Home Page: http://www.odu.edu/msve
ODU Curriculum Sheets for VCCS Students: https://www.odu.edu/academics/programs/curriculum-sheets
TCC Transfer Information: http://tcc.edu/academics/degrees/transfer/transfer-agreements

ODU Modeling, Simulation & Visualization Engineering Transfer Worksheet (Unofficial)

(BS Degree: 2015-16 Catalog)

ODU Course #	ODU Course Title	Cr	√	Transfer Credit from TCC
ENGL 110C	English Composition	3		ENG 111
MATH 211	Calculus I	4		MTH 173
CHEM 121N/122N	Chemistry I and Chemistry Lab	4		CHM 111
ENGN 110	Engineering & Tech I	2		EGR 120
COMM 101R	Public Speaking	3		CST 100
MATH 212	Calculus II	4		MTH 174
CS 150	Intro to Programming	4		EGR 125
CHEM 123N	Chemistry II	3		CHM 112
PHYS 231N	University Physics I	4		PHY 241
MSIM 111	Information Literacy & Research	2		EGR 110
MSIM 201	Introduction to M & SE	3		EGR 218
PHYS 232N	University Physics II	4		PHY 242
STAT 330	Probability and Statistics	3		MTH 243
CS 252	Introduction to UNIX	1		ITN 171 (4 cr)
CS 250	Problem Solving & Programming	4		CS 210
MSIM 205/281	Discrete Event Simulation & Lab	4		EGR 230
GEN ED	Human Creativity	3		A. S. Degree *
MATH 307 (280)	Differential Equations	3		MTH 279
GEN ED	Literature	3		A. S. Degree *
ENGL 231C	Technical Writing	3		ENG 131
MSIM 320	Continuous Simulation	3		
MSIM 382	Continuous Simulation Lab	1		
CS 330	Object Oriented Prog. & Design	3		
CS 381	Discrete Structures	3		
GEN ED	Human Behavior	3		A. S. Degree *
Upper Division	Approved Program Elective	3		
MSIM 331	Simulation Software Design	3		
MSIM 383	Simulation Software Design Lab	1		
MSIM 451	Analysis for Modeling & Sim.	3		
MSIM 410	System Modeling	3		
GEN ED	Interpreting the Past	3		A. S. Degree *
GEN ED	Upper Division	3		
MSIM 441	Comp Graphics & Visualization	3		
MSIM 487W	Capstone Design I	3		
MSIM 4YY	Approved MSIM Elective	3		
GEN ED	Upper Division	3		
ENMA 401	Project Management	3		
MSIM 488	Capstone Design II	3		
Elective	Approved Program Elective	3		
ENMA 480	Engineering Ethics	3		
MSIM 4YY	Approved MSIM Elective	3		
GEN ED	Impact of Technology	3		
	Total credits in B.S. degree:	**127**		**Max Total Transfer Credits: 67**

Note: The ODU Foreign Language Requirement is waived if the A. S. Degree has been completed.

* If the A.S. Degree is completed, the 12 credits of TCC General Education requirements transfer as a block to cover the 12 credits of ODU General Education requirements (see chart on page 20).

Virginia Tech Transfer Information

Virginia Tech's College of Engineering is consistently ranked as one of the top engineering colleges in the nation in the quality of its undergraduate education. Virginia Tech offers Bachelor of Science degrees in the following fields:

Aerospace Engineering	Biological Systems Engineering	Chemical Engineering
Civil Engineering	Computer Engineering	Engineering Science and Mechanics
Electrical Engineering	Material Science & Engineering	Industrial and Systems Engineering
Ocean Engineering	Mechanical Engineering	Mining & Minerals Engineering
Computer Science		

Articulation Agreement with Virginia Tech:

In 1992 a Guaranteed Admission Agreement (GAA) was developed between Virginia Tech and all colleges in the VCCS, including TCC. The GAA guarantees transfer admission into the College of Engineering at Virginia Tech for all students who complete the A.S. degree in Engineering and have a minimum GPA of 3.2 (with some other restrictions). A copy of the articulation agreement is available at http://cdn.vccs.edu/wp-content/uploads/2014/07/VCCS_VTEng_GAA_FINAL_0614.pdf

Notes on the Guaranteed Admission Agreement (GAA):

1. There are several important reasons to ***complete the A.S. degree in Engineering*** before transferring to Virginia Tech:
   - Admission is only ***guaranteed*** if you complete the A.S. degree in Engineering (in addition to other requirements)
   - Students receive block credit for general education requirements. All degrees from Virginia Tech must satisfy Areas 1-7 of the Virginia Tech Core Curriculum. Completing the A.S. degree* automatically satisfies Areas 1-7. If the degree is not completed, students must be sure to take specific general education courses to satisfy each of these areas. (* All credits must be from the VCCS ("native credit"). If a student has any transfer credits from non-VCCS colleges, then block credit will not be awarded for general education, but the 3.2 guaranteed admission still applies.)
   - The ***Leo Padis Scholarship*** is available only to transfer students from Virginia Community Colleges that complete the A.S. degree in Engineering. The application is available online at: http://eng.vt.edu/academics/undergraduate-students/scholarships-for-prospective-students.html
   - Speakers from Virginia Tech typically visit TCC each Fall semester. They always encourage students to compete the A.S. degree and indicated that students that complete the degree before transferring have a higher rate of success.
2. When students are accepted for transfer admission to Virginia Tech, they are placed in the College of Engineering and admission into the engineering program (e.g., Civil, Electrical, Mechanical, etc.) of your choice is not guaranteed. Students can apply for admission into a specific department after completing at least 12 credits* at Virginia Tech and satisfying all freshman courses. If the student has at least a 3.0 GPA then they can transfer into the department of their choice. (* new restrictions may require that these credits be technical courses). Note that if a student does not gain entry into the department of their choice after the first semester, they may be restricted from taking courses in this major, so it is important to have a successful first semester).
3. 3.2 is the minimum GPA to have ***guaranteed*** admission to Virginia Tech, but you might be accepted with a lower GPA.
4. Students can apply to transfer before completing the A.S. degree in Engineering (perhaps after the freshman year), but the guaranteed admission agreement does not apply. A minimum GPA of 3.5 is recommended if you plan to apply without completing the A.S. degree in Engineering.

5. The Articulation Agreement shows that 60 credits in the appropriate areas are required, but you can transfer up to half of the credits in the B.S. degree (typically around 64 credits). You might check the Virginia Tech Transfer Guide to see what other courses will transfer. If you have more than 64 transferrable credits, Virginia Tech will work with you when you arrive to determine exactly which credits will be transferred.
5. Students may also be interested in knowing that some of the less common areas of engineering such as Biological Engineering and Mining & Minerals Engineering often have some advantages such as
    - less stringent transfer requirements (often less than a 3.0 GPA is required for the first 12 credits completed at Virginia Tech)
    - smaller class sizes
    - scholarships in these areas are much easier to obtain. As an example, it is reported that most students in the Mining & Minerals Engineering program are on scholarship (the mining industry provides most of the scholarships).

Tablet Computers:

Virginia Tech requires all engineering students to own a tablet computer as well as a specific list of software. The requirements in terms of hardware and software change each year so you should request information concerning the current requirements (since you will transfer in to VT as a junior, look for the requirements for the junior class). If you do not already own a tablet computer, Virginia Tech sells computers, software, and service agreements that you might wish to consider. Financing is available to finance computers over the length of your degree program.

Scholarship Information:

Scholarships specifically for transfer students are sometimes hard to obtain, but Virginia Tech does offer one such scholarship. The Leo A. Padis Scholarship is available only to students graduating from a Virginia Community College and transferring into Virginia Tech's College of Engineering.

- The applicant must complete the A.S. degree to be eligible.
- Selection is based on academic performance.
- The number of scholarships varies, but is typically 4 or more at $1000/year for each scholarship.
- The deadline for application is typically June 1.
- The application is available at: http://eng.vt.edu/academics/undergraduate-students/scholarships-for-prospective-students.html

Important Online Resources

- ***Virginia Tech College of Engineering***: http://www.eng.vt.edu/
- ***Curriculum Checksheets*** – visit the engineering department of your choice online and look for curriculum "check sheets". The check sheets list detailed requirements for each engineering degree by the graduation year. For example: http://www.ece.vt.edu/ugrad/curriculum/index.php
- ***VCCS to Virginia Tech Transfer Guide*** - http://www.tranguide.registrar.vt.edu/
- ***Course recommendations by Virginia Tech major:***
  http://www.tranguide.registrar.vt.edu/2015/bymajor/index.html
  Note: This site may not show all transferrable courses. For example, Civil Engineering does not list EGR 245, but the Civil Engineering checksheet shows that EGR 245 can be used to satisfy required Engineering Science electives. Similarly, this site does not correctly show for EE students that EGR 125 transfers as ECE 1574 and that EGR 140 can be used as an engineering elective.
- ***Virginia Tech courses and VCCS transfer equivalents:***
  http://www.tranguide.registrar.vt.edu/2015/vccs/index.html

Applying for Admission to Virginia Tech:

Students should apply for transfer admission online at: https://eng.vt.edu/admissions/transferring.html

Fall admission:	Apply by February 15
Spring admission:	Generally not allowed
Summer admission:	Same as fall admission. If you are admitted for the fall semester, you can also attend the summer semester if you wish.
Priority Review:	For VCCS students only. Typically apply by first week in January. For more information: http://www.admiss.vt.edu/apply/application-policies/
Instant Decision Day:	For early acceptance, check on the details on Instant Decision Day at http://admissions.vt.edu/apply/transfers/instant-decision-day.html

There are no advantages to applying early during the Fall semester, so wait until your Fall semester grades are on your transcripts before applying. Students will be notified concerning their acceptance by May 15 or as soon as possible.

Students considering Virginia Tech are strongly encouraged to obtain information early on the engineering program of their choice. This will allow them to compare the 2-year curriculum at TCC to the desired Virginia Tech curriculum and allow them to plan their schedules wisely. Virginia Tech offers accelerated summer sessions where students may take courses that they are lacking so that they can make a smooth transition into the junior year of their program. Virginia Tech tries to offer courses which transfer students often lack during the summer.

Transfer Student Orientation: Virginia Tech hosts an orientation for newly accepted transfer students each June. See details at: http://nsp.vt.edu/new_student_orientation/transfer_orientation.html

Other notes related to admission:

1. If you transfer less than 45 credits to Virginia Tech, you must also send high school transcripts and SAT scores.
2. International students must score a minimum score of 550 on the TOEFL (not required if ENG 111-112 have been completed).
3. No students are accepted for transfer without ENG 111-112 or the equivalent.
4. Virginia Tech has a foreign language requirement. If you are using high school foreign language courses to meet this requirement be sure to send high school transcripts. Students who speak a native language other than English are exempt from this requirement.
5. If you have any special circumstances to explain (such as a low GPA due to old grades in another curriculum) include a letter of explanation with your application.
6. Send transcripts from all colleges that you have attended. Just because TCC gave you credit for a course from another college, it is not guaranteed that Virginia Tech will do so.
7. Only courses in which you received a grade of C or better will transfer.

For additional information, contact:

Paul Gordy, Engineering Program Head, TCC - Virginia Beach Campus
Office: H-115 (Advanced Technology Center)
Phone: 822-7175
E-mail: Pgordy@tcc.edu

Transfer of courses to Virginia Tech

Virginia Tech provides an online transfer guide at: http://www.tranguide.registrar.vt.edu/
Note that only certain courses below may be needed for specific engineering disciplines at Virginia Tech. For example, all disciplines require all of the MATH courses listed below whereas EGR 271-272 are only required for electrical and computer engineering and CHM 241&245 are only required for chemical engineering. See the VT department checksheet for more information.

TCC Course #	TCC Course Title	TCC Cr	VT Course #	VT Cr
EGR 110	Engineering Graphics	3	ENGE 1215	2
EGR 120	Intro to Engineering	2	ENGE 1216	2
EGR 125	Intro to Engineering Methods (C++)	4	ENGE 2324 or ENGE 2314 or ECE 1574	1, 2 or 3
EGR 140	Statics	3	ESM 2104	3
EGR 245	Dynamics	3	ESM 2304	3
EGR 246	Mechanics of Materials	3	ESM 2204	3
EGR 270	Fund of Computer Engineering	4	ECE 2504	3
EGR 271-272**	Circuit Theory I-II	6	ECE 2004	3
GOL 105	Geology	4	GEOL 2104	4
MTH 173	Calculus I	5	MATH 1225	4
MTH 174	Calculus II	4	MATH 1226	4
MTH 277	Vector Calculus	4	MATH 2204	3
MTH 279	Differential Equations	4	MATH 2214	3
MTH 285	Linear Algebra	3	MATH 2114	3
PHY 241 - 242	University Physics I - II	8	PHYS 2305 - 2306	8
CHM 111*	Chemistry I	4	CHEM 1035, CHEM 1045	4
CHM 112*	Chemistry II	4	CHEM 1036, CHEM 1046	4
CHM 111 – 112*	Chemistry I-II	8	CHEM 1074-1084	3
CHM 241	Organic Chemistry I	3	CHEM 2535	3
CHM 245	Organic Chemistry I Lab	2	CHEM 2545	2
CHM 242	Organic Chemistry II	3	CHEM 2536	3
CHM 246	Organic Chemistry II Lab	2	CHEM 2546	2
ENG 111	English Composition I	3	ENGL 1105	3
ENG 112	English Composition II	3	ENGL 1106	3
HIS Elect	History Elective	3	See Note	3
Soc Sci Elect	Social Science Elective	3	See Note	3
Hum Elect	Humanities Elective	3	See Note	3
CSC 201	Computer Science I	4	CS 1044	3

Note: If students satisfy the articulation agreement (complete the A.S. degree with a minimum 3.2 GPA and have all native VCCS credit) then general education requirements are transferred as a block, so the exact courses used for History, Social Science, and Humanities electives do not matter. If students do not satisfy the "native degree" requirement, then specific courses should be selected in order to satisfy Virginia Tech's University Core Curriculum (the 3.2 guaranteed admission still applies).

* Virginia Tech does not require CHM 112 for any engineering majors except chemical engineering. TCC students may substitute any 4 credits not needed for their AS degree in Engineering in place of CHM 112. See Paul Gordy in H-115 to complete an official Course Substitution form.

** Currently being evaluated for transfer credit