Forsyth County Schools COLLEGE & Career DEVELOPMENT

COURSE TITLE:	Foundations of Engineering		
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Forsyth County Schools
Course Syllabus 2022/2023

Course Description: Foundations of Engineering and Technology is the introductory course for the Engineering and Technology Education pathways. This STEM driven course provides the students with an overview of engineering and technology including the different methods used in the engineering design process developing fundamental technology and engineering literacy. Students will demonstrate the skills and knowledge they have learned through various project based activities while using an engineering design process to successfully master the "E" in STEM.

Standards: Forsyth County offers many State Board of Education approved CTAE Career Pathways with three sequenced courses. *To view course standards, pathway guides, and plans of study, visit the following links:*

Standards: *https://www.gadoe.org/Curriculum-Instruction-and-Assessment/CTAE/Pages/cluster-pathway-courses.aspx*

Programs of Study:
https://www.gadoe.org/Curriculum-Instruction-and-Assessment/CTAE/Pages/Programs-of-Study.aspx

STEM-FET-1 is included in all CTAE courses to demonstrate employability skills required by business and industry.

1.1 Communicate effectively through writing, speaking, listening, reading, and interpersonal abilities.
1.2 Demonstrate creativity by asking challenging questions and applying innovative procedures and methods.
1.3 Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.
1.4 Model work readiness traits required for success in the workplace including integrity, honesty, accountability, punctuality, time management, and respect for diversity.
1.5 Apply the appropriate skill sets to be productive in a changing, technological, diverse workplace to be able to work independently and apply team work skills.
1.6 Present a professional image through appearance, behavior and language.

STEM-FET-2 Develop an understanding of engineering and technology and describe the principal fields of engineering specializations (ex. aeronautical, automotive, chemical, civil, industrial, mechanical, computer software, electrical, and biomedical) and identify associated career tracks.

2.1 Explain a contemporary definition of engineering.
2.2 Identify education requirements for engineering occupations and locations where programs of study are available.
2.3 Match engineering job titles with qualifications and responsibilities.
2.4 Participate in activities related to career interests.
2.5 Explain how each engineering discipline will relate to a green environment and sustainability.

STEM-FET-3 Identify the history of technology and engineering and its impact on society in the past, present, and future.

3.1 Describe the history and development of engineering.
3.2 Describe the social, economic, and environmental impacts of a technological process, product, or system.
3.3 Explain the influence of technology on history and the shaping of contemporary issues.
3.4 Describe the relationship between the STEM cluster and society.
3.5 Evaluate the impact of science and society based on products and processes used in the real world for technological development.
3.6 Understand STEM knowledge and skills to analyze and suggest solutions to human societal problems.
3.7 Apply STEM knowledge and skills through hands-on research and lab experiments that are focused upon recreating the inventions and social solutions that were realized in the past, present, and possible future.
3.8 Identify key people who have influenced technological change.
3.9 Describe the impact of governmental and political systems on technological innovations.
3.10 Demonstrate ethical and professional engineering behavior in the development and use of technology.

STEM-FET-4 Demonstrate and follow safety, health, and environmental standards related to the Science, Technology, Engineering, and Math (STEM) workplaces.

4.1 Implement workplace and product safety standards such as OSHA, EPA, ISO, GMP, and UL. (STEM-ST3).
4.2 Accurately interpret safety signs, symbols, and labels (Hazardous Communications).
4.3 Demonstrate and incorporate safe laboratory procedures in lab, shop, and field environments.
4.4 Explain how the incorporation or lack of safety practices impact the economy and costs of safety in business and industry.
4.5 Identify, select, and use appropriate Personal Protective Equipment (PPE), follow work area organization procedures and follow Standard Operating Procedures (SOP) when performing work.

STEM-FET-5 Identify criteria of usage, care, and maintenance for tools and machines.

5.1 Identify, select, and use appropriate tools and machines for specific tasks.
5.2 Demonstrate safe use of tools and machines.
5.3 Use precision tools and instruments to measure and convert units.
5.4 Utilize appropriate computer hardware and software to compose, analyze and synthesize data to document the design process.
5.5 Apply proper maintenance techniques for tools, machines, and hardware.

STEM-FET-6 Apply fundamental principles of the engineering design process.

6.1 Understand and apply the engineering design process through project based learning activities.
6.2 Conduct technical research to develop possible solutions to a stated engineering problem.
6.3 Refine a design by using technical sketches, prototypes and modeling to ensure quality, efficiency, and productivity of the final product.
6.4 Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process (optimization and iterations) in order to check for proper design and note areas where improvements are needed.
6.5 Apply engineering economics and optimal design techniques to a design solution.
6.6 Record and organize observations and test data during design evaluation.
6.7 Finalize solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, qualitative, virtual, and physical means.

STEM-FET-7 Use appropriate technology to collect, record, manipulate, analyze, and report data.

7.1 Demonstrate the ability to recognize cause and effect when faced with projects or issues.
7.2 Recognize measurable attributes in units, objects, systems, and processes in assigned activities.
7.3 Organize data and the consequences of the problems or issues, and research the material placing it in manageable formats.
7.4 Attempt to predict the outcomes based on data collected in a project or experiment.
7.5 Defend one's position based on quality collection of facts and data supporting plans, processes, and/or projects.
7.6 Draw a conclusion when confronted with data or observations that focus on the observed plans, processes, or projects at hand.
7.7 Analyze change as a result of data differences and changing environmental values.
7.8 Use qualitative and quantitative skills to conduct a simple scientific inquiry and economic analysis; use the data to draw a conclusion based on the analysis.
7.9 Recognize the value of the reiterative process to improve date and to improve the design process.

STEM-FET-8 Students design a solution to an engineering problem applying math and science principles.

8.1 Apply science and mathematics concepts and principles to resolve plans, projects, processes, issues, or problems through methods of inquiry.
8.2 Use the protocols in science and mathematics to integrate solutions related to technical or engineering activities using the content and concepts related to the situation or problems.
8.3 Explain the role of modeling and/or simulation in science and engineering.
8.4 Communicate and collaborate with others on inquiry or resolution of issues/problems in the global community.
8.5 Defend one's solution based on quality collection of facts and data supporting plans, processes, and/or projects and communicate the solution both orally and written.

STEM-FET-9 Demonstrate the application of STEM in the real world.

9.1 Summarize and differentiate the uses of engineering and various technologies for STEM fields such as Aerospace, Automotive, Medical, Biotechnology, Energy and Power, Information and Communication, Automation and Robotics, Transportation, Manufacturing, and Construction.

STEM-FET-10 Students explore how related career and technology student organizations are integral parts of career and technology education courses. Students will develop leadership, interpersonal, and problem-solving skills through participation in co-curricular activities associated with the Technology Student Association.

10.1 Explain the goals, mission and objectives of CTSO organizations.
10.2 Explore the impact and opportunities a student organization (TSA) can develop to bring business and education together in a positive working relationship through innovative leadership and career development programs.
10.3 Explore the local, state, and national opportunities available to students through participation in related student organization (TSA) including but not limited to conferences, competitions, community service, philanthropy, and other (TSA) activities.
10.4 Explain how participation in career and technology education student organizations can promote lifelong responsibility for community service and professional development.
10.5 Demonstrate teamwork, leadership, interpersonal relations, and project management.
10.6 Through teamwork, apply the skills and abilities in requirements analysis and configuration control while working with plans, processes, and projects as assigned.
10.7 Through teamwork, use the skills required in project management to track and assess the progress of a plan, process, or project as assigned.
10.8 Through teamwork, apply the skills in quality assurance as well as those in process management and development for appropriate applications of systems integration techniques to an assigned project.
10.9 Effectively use project management techniques (e.g., teamwork, appropriate time management practices, effective organizational skills, conduct analysis of cost, resources, and production capacity, and quality practices with continuous improvement).
10.10 Understand and demonstrate proper work ethics when working with plans, processes, and projects as assigned.

CTSO Affiliation (Career Tech Student Organizations): CTSOs are co-curricular organizations with leadership programs and competitive events which reflect current curriculum standards and competencies for the instructional programs they serve. Teachers infuse CTSO activities into the instructional activities, thereby helping students see the real world value of their academic studies. The CTSOs for this course appear below, and students are encouraged to take advantage of these additional leadership opportunities.

FIRST Robotics: The mission of FIRST Robotics is to inspire young people to be science and technology leaders and innovators, by engaging them in exciting mentor-based programs that build science, engineering, and technology skills, that inspire innovation, and that foster well-rounded life capabilities including self-confidence, communication, and leadership.

BEST Robotics: Through participation in this project-based STEM program, students learn to analyze and solve problems utilizing the Engineering Design Process, which helps them develop technological literacy skills. It is these skills that industry seeks in its workforce.

TSA: The mission of the Technology Student Association is learning to lead in a technical world. TSA enhances personal development, leadership, and career opportunities in STEM, whereby members apply and integrate these concepts through intracurricular activities, competitions, and related programs.

VEX Robotics: The mission of VEX Robotics is to envision a world where every student has the opportunity to be inspired by the excitement of hands-on, minds-on STEM learning and the feeling of creating something with technology.

Electrathon America: The mission of Electrathon America is to provide hands on opportunities for participants to learn about STEM principles as they design and build an electric vehicle for competition.

Required Assignments: Foundations of Engineering will require students to demonstrate proficiency based on summative, formative assessments and class based projects.

Availability for Extra Help: Extra help is available during "Open Lab" hours on Tuesdays & Thursdays after school until 5:00pm, and during IF time.

Makeup Work: Make up work is defined as work assigned during a student's absence, not work assigned prior to an absence. The student has five (5) school days upon returning to school to complete make-up work. The teacher has the discretion to grant a longer period to make up work, if there are extenuating circumstances.

Grading Calculations:
Non-EOC Course Average = 50% (1st Sem. Course Work) + 50% (2nd Sem. Course Work)
1st and 2nd Semester Course Work = 75% Summative + 25% Formative

Grading Policy:
A = 90 – 100
B = 80 – 89
C = 70 – 79
Failing = Below 70

Formative Assessments include, but are not limited to homework, class work, practice tests, rough drafts, and sections of projects/ research papers/presentations.

Summative Assessments include, but are not limited to unit tests, final projects, final essays, final research papers, and final presentations.

Learning Resources/Textbook(s): All learning resources, both print and digital, are meant to support and enhance the student learning experience of this class. Below are the names of the textbooks and websites that will be used in this course. Some of the web-based resources require parent permission per federal regulations. Federal laws that guide parent permission requirements are as follows:

- **Children's Internet Protection Act (CIPA):** The school is required by CIPA to have technology measures and policies in place that protect students from harmful materials including those that are obscene and pornographic. Any harmful content contained within inappropriate sites will be blocked. http://fcc.gov/cgb/consumerfacts/cipa.html
- **Children's Online Privacy Protection Act (COPPA):** COPPA applies to commercial companies and limits their ability to collect personal information from children under 13years of age. No personal student information is collected for commercial purposes. https://www.ftc.gov/tips-advice/business-center/guidance/complying-coppa-frequently-asked-questions-0
- **Family Educational Rights and Privacy Act (FERPA):** FERPA protects the privacy of student education records and gives parents the right to review records. Under FERPA, schools may disclose directory information in certain circumstances. http://www2.ed.gov/policy/gen/guid/fpco/ferpa

Please review the resource lists below. Each website related to the curriculum resources is provided along with their privacy policies. Should you have any questions regarding these resources immediately contact the course teacher via email or phone.

**** The following resources are county approved. These resources may vary by school due to sequencing, pacing, curriculum design, and/or individual needs of students.***

Name of Resource*	Hard copy/Website	Privacy Policy
Virtual Job Shadow	Website	https://www.virtualjobshadow.com/resources/policy/
Talk Hiring Job Interview Practice	Website	https://www.talkhiring.com/privacy-policy
Amatrol Learning	Classlink	https://amatrol.com/privacy/
Autodesk Suite	Website	https://www.autodesk.com/company/legal-notices-trademarks/privacy-statement
YouScience	Website	https://www.youscience.com/privacy-policy/
Office 365	Classlink	
SolidProfessor	Classlink	
SolidWorks	Website	Privacy Policy
SP2- OSHA Certification	Website	https://sp2.org/privacy-policy/

***** The following resources are web-based resources that require parent permission. By signing the syllabus, the parent is approving these resources. Should you have any questions regarding any of these classroom resources, please contact your student's teacher via email.***

Parent Initial for Approval **	Name of Resource	Website	Privacy Policy
	O*Net Online	https://www.onetonline.org/	https://www.onetcenter.org/privacy.html

Dress for Success: Career and technical education pathways in Forsyth County incorporate Dress for Success Days throughout the school year. These experiences allow students to foster confidence and continue to develop a positive self-image, while understanding the importance of dressing well for their future profession. At certain intervals throughout the course, students will analyze industry standards of the profession and study the importance of dressing well for a job interview. This will culminate into being fully prepared for Community Mock Interviews which occur as students complete a career pathway.

Industry Credentialing/Credentials of Value (EOPA): Students are encouraged to select a career pathway beginning in the ninth or tenth grade that is connected to college and career goals. This course is one of three courses in the career pathway chosen by a student. At the conclusion of the third pathway course, students will be required to take an industry credentialing assessment. This assessment provides students an opportunity to demonstrate what they have learned by completing an online, nationally recognized exam and allows students the ability to earn a FCS Pathway Medallion and State Career Pathway Diploma Seals upon graduation. Student directory information may be shared with credentialing vendors offering the assessment.

The rigorous/technical coursework that you have been taking or will take in future years will provide you the foundational knowledge you will need for this exam. Your teacher will provide you the testing details and share the study guide and resources that are available to also assist you in preparation for this industry certification exam.

Credential of Value (EOPA) Assessment Name: Engineering Assessment (State Developed), Test Code: 7773
Credential of Value (EOPA) Assessment Vendor: NOCTI

Resource section. I will support my student following the classroom expectations outlined in this course syllabus. I agree that I am the person who is legally allowed to consent for my student whose name is listed below.

_____
Student's Name (Print)

_____
Parent's Name (Print)

_____ _____
Parent Signature Date