Final Common First Year Framework Proposal – February 14, 2024

Produced by the Common First Year Committee

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- **Every first-time-in-college student will take a common curriculum (CFY) upon entering the LCoE; when admitted they will have a major of FEGR, and will have the option of specifying their target major, if desired**
- **The CFY will consist of three tracks that students need to complete: the Engineering track (orange), the Math/Science track (blue) and the General Education track (green).**
- **Students must take the prescribed first semester courses during their first semester.**
- **The MATH sequence that each individual takes (MATH #1 / MATH #2) is matched to their individual placement in MATH**
- **The framework relies on Calc I and Physics I being taught simultaneously *(needs to be planned with the Math & Physics Depts)***
- **Students will declare or confirm their major during the registration process for their 3rd semester. Specific entrance criteria for a major will be determined by each program.**
- **ALEKS test taken by May - every student should take**

Course #	Course name	SCH	Pre/Co-reqs	Transfer equivalent
First semester				
ENGR-1300	Exploring Engineering & Technology w/ Success	2	None	EGR 150
	MATH #1	3	Varies	MAT 271
ENGR-1301	Foundations of Math & Science for Engineering	3	None	Chemistry or other science
XXXX-15xx + WRDS	Gen Ed Theme Course	3	None	Gen Ed
XXXX-15xx	Gen Ed Theme Course	3	None	Gen Ed
	Total:	**14**		
Second Semester				
ENGR-1302	Logic and Computational Problem Solving	3	None	
ENGR-1303	Engr Visualization & Graphical Communication	3	None	DFT 170
	MATH #2	3	Varies	MAT 272
PHYS-2101	Physics for Science and Engineering I	3	Calc I as pre or co	PHY 251
PHYS-2101L	Physics for Science and Engineering I Laboratory	1	Calc I as pre or co	PHY 251
WRDS-1103	Writing and Inquiry in Academic Contexts I and II	3	None	ENG 111
	Total:	**16**		

Note: Functional Syllabi appear on following pages

Math Sequence (example tracks, individualized to each student)

	First Sem (MATH #1)	Second Sem (MATH #2)
Student A	Algebra / Precalc	Calc I
Student B	Precalc	Calc I
Student C	Calc I	Calc II
Student D	Calc II	Calc III or Diff Eq
Student E	Calc III or ...	Calc IV or Diff Eq or ...

UNIVERSITY OF NORTH CAROLINA CHARLOTTE | THE WILLIAM STATES LEE COLLEGE OF ENGINEERING

SYLLABUS

Course: **ENGR-1300 – Exploring Engineering and Technology w/ Success**
Credit hours: 2

Course Description

Foundational knowledge of the primary engineering fields and careers, in the areas of Civil, Computer, Electrical, Environmental, Mechanical and Systems. Hands-on introduction to the techniques and applications of engineering design: how to conceptualize, design, build, and assess a prototype that solves a real engineering problem. Also help students successfully transition into college, integrate into the College of Engineering community, and learn and apply academic success strategies

Pre-/Co-requisites None

Outcomes

1) **Awareness of** engineering projects and how all the disciplines work together
2) Familiarity with different engineering careers
3) Exposure to Engineering problems & Practicing Engineering calculations
4) Hands-on introduction to engineering projects and the engineering design process
5) Team Development
6) Effective Workload Management, Study skills and Exam Preparation
7) Academic and Professional Ethics
8) Future Planning

Topics

The following topics are covered throughout the course, interwoven through a series of lectures and hands-on projects and/or activities.

A. Introduction
B. What are engineering and engineering technology?
C. Engineering as a Profession / What are the specialty areas of engineering? How do the engineering disciplines work together?
D. Introduction to engineering projects and “What is the engineering design process?”
E. Discipline deep-dive: Electrical and Computer
F. Discipline deep-dive: Mechanical and Civil
G. Discipline deep-dive: Systems and Environmental
H. What do engineers do day-to-day?
I. How engineers communicate
J. Engineering calculations & applications
K. Defining problems
L. Brainstorming / Researching Designs
M. Modeling and testing
N. Stages of team development
O. Introduction to Success
P. Academic and Professional Ethics
Q. Effective Time and Workload Management
R. Note taking, Study, and Learning Skills
S. Effective Textbook Usage and Exam Preparation
T. Computing effectively
U. Self-Directed Learning and Research

Activities

V. Project 1: (model) Systems / Environmental
W. Project 2: (prototype) Mechanical / Civil
X. Project 3: (prototype) Electrical / Computer

UNIVERSITY OF NORTH CAROLINA CHARLOTTE | THE WILLIAM STATES LEE COLLEGE OF ENGINEERING

SYLLABUS

Course: **ENGR-1301 – Foundations of Math & Science for Engineers**
Credit hours: 3

Course Description

The study of foundational math and science, including vectors, vector algebra, units, Newton's laws, atomic structure, properties of matter, quantum mechanics, ideal gas law, chemical bonding, etc. Lectures and breakout practice/lab sessions.

Pre-/Co-requisites

None

Outcomes

1) Express physical quantities in the proper units (either SI or English)
2) Apply mathematical operations to engineering and chemical expressions
3) Describe the properties of materials at the atomic and molecular level (quantum mechanics)
4) Describe the results of chemical reactions
5) Describe the collective behavior of molecules and solutions
6) Understand and calculate vector quantities and components
7) Understand the basics of thermodynamic properties

Topics

(*based on multiple feedback, note that topics H-Q will be re-evaluated, prioritized and compromised between programs by a multi-department implementation committee during the implementation phase)

A. Basic vector quantities, displacement, velocity, acceleration
B. Vector Algebra - Addition, Subtraction
C. Vector Algebra - Dot Products, Cross Products.
D. Exponents, Algebraic expression
E. SI and English units, Units of length, dimensional analysis, calculating with units
F. Newton's Laws and Conservation of Momentum (The rocket equation)
G. Reflection and Refraction
H. Intro to Quantum Mechanics: Atomic Structure, Orbitals and the Periodic Law
I. Atomic, Molecular and Molar Mass, Avogadro, Formulas and Composition Calculations
J. Electron Configurations
K. Chemical Bonding, Formal Charges, VSPER, Molecular Structure
L. Balancing Equations and Limiting Reactants
M. Concentration of Solutions (Molarity, Normality, Molality, Mole fraction)
N. Oxidation-Reduction, Electrochemistry, Nernst Equation
O. Properties of Solutions (Vapor Pressure, Boiling Point, Freezing Point, Osmotic Pressure)
P. Solids (crystal structures)
Q. Thermochemistry, Laws of Thermodynamics and Chemical Equilibrium, The Ideal Gas Law

UNIVERSITY OF NORTH CAROLINA CHARLOTTE | THE WILLIAM STATES LEE COLLEGE OF ENGINEERING

SYLLABUS

Course: **ENGR-1302 – Logic and Computational Problem Solving**
Credit hours: 3

Course Description

Examine real-world engineering problems and develop a methodology for computationally solving them. A modern programming language is introduced.

Pre-/Co-requisites

None

Outcomes

1) Introduce a problem solving mindset
2) Identify engineering problems from each discipline and formulate a set of possible solutions
3) Apply computational solutions to these engineering problems
4) Work on practical engineering problems that involve the use of microcontrollers (e.g. Arduino) and processing of data acquired from sensors.
5) Introduction to Artificial Intelligence and its applications in computational problem solving

Topics

The following topics are covered throughout the course, through a series of lectures and hands-on activities, including projects that program hardware devices.

A. Introduction and operating system basics
B. Engineering problem solving exercises
C. Understanding Sequencing
D. Binary numbers
E. Engineering problem solving exercises (systematic lists, proper condition, simple, complex)
F. Introduction to programming language syntax
G. Relational operators
H. Solving engineering problems using conditional statements
I. Logic operators and conditionals
J. Controls and naming conventions
K. Event driven programming and procedures
L. Solving engineering problems using Event Driven Programming
M. Variable and assignment statements
N. Storing numbers / characters, arrays
O. Input and data conversion
P. Reading and debugging programs
Q. Simple conditionals
R. Nested if statements/else ifs
S. For loops / Iterators / While loops
T. Loop control / tracing
U. Nested For loops / recursion
V. Reading / Writing / Debugging programs
W. Sub-procedures
X. Parameters and arguments
Y. Solving Mechanical, Environmental, Civil, Systems and Electrical Engineering computational problems
Z. Artificial Intelligence in computational problem solving

UNIVERSITY OF NORTH CAROLINA CHARLOTTE | THE WILLIAM STATES LEE COLLEGE OF ENGINEERING

SYLLABUS

Course: **ENGR-1303 – Engineering Visualization and Graphical Communication**
Credit hours: 3

Course Description

Develop foundational knowledge and skills to effectively visualize and communicate complex three-dimensional designs and data sets. Through hands-on and practical applications, students learn techniques and tools to create visual spatial representations and conduct data analysis that aids in decision-making. Online 2D and 3D applications will be used, as well as spreadsheets and mathematical analysis software.

Pre-/Co-requisites

None

Outcomes

1) Recognize the importance of visualization and graphical communication
2) Sketch objects and systems
3) Read and create simple drawings
4) Manipulate and represent data
5) Learn to express data in visually meaningful ways
6) Generate basic 3D models and use 3D printing to manufacture components

Topics

A. Introduction to Visualization
B. Sketching techniques, scales, lettering
C. Sketching straight lines, circles, arcs, and ellipses
D. Sketching 2D objects & 3D objects
E. Sketching assemblies
F. 2D Drawings - necessary views, right hand views, section views, reading, dimensions and tolerances, generating
G. Electrical Diagrams (electrical application)
H. Landform Drawings (civil application)
I. Mechanical Drawings (mechanical application)
J. Facility Layout Drawings (systems application)
K. Intro to visualization of data; types of graphs (scatter, line, bar, etc.)
L. Types of data (time dependent, budgetary, etc.)
M. Data - initial entry and formatting
N. Data - analysis and manipulation
O. Data - representation of uncertainty
P. Data manipulation and visualization in Excel & MATLAB
Q. Visualizing 3D data (surface plots)

UNIVERSITY OF NORTH CAROLINA CHARLOTTE | THE WILLIAM STATES LEE COLLEGE OF ENGINEERING

SYLLABUS

Course: **ENGR-1300 – Exploring Engineering and Technology w/ Success**
Credit hours: 2

Course Description

Foundational knowledge of the primary engineering fields and careers, in the areas of Civil, Computer, Electrical, Environmental, Mechanical and Systems. Hands-on introduction to the techniques and applications of ~~the~~ engineering design ~~process~~: how to conceptualize, design, build, and assess a prototype that solves a real engineering problem. Also help students successfully transition into college, integrate into the College of Engineering community, and learn and apply academic success strategies

Pre-/Co-requisites

None

Outcomes

1) **Awareness of** ~~Understanding~~ engineering projects and how all the disciplines work together
2) Familiarity with different engineering careers
3) Exposure to Engineering problems & Practicing Engineering calculations
4) Hands-on introduction to engineering projects and the engineering design process
5) Team Development
6) Effective Workload Management, Study skills and Exam Preparation
7) Academic and Professional Ethics
8) Future Planning

Topics

The following topics are covered throughout the course, interwoven through a series of lectures and hands-on projects and/or activities.

A. Introduction
B. What are engineering and engineering technology?
~~C.~~ Engineering as a Profession / What are the specialty areas of engineering?
~~D.~~C. How do the engineering disciplines work together?
~~E.~~ Introduction to engineering projects and
~~F.~~D. "What is the engineering design process?"
~~G.~~E. Discipline deep-dive: Electrical and Computer
~~H.~~F. Discipline deep-dive: Mechanical and Civil
~~I.~~G. Discipline deep-dive: Systems and Environmental
~~J.~~H. What do engineers do day-to-day?
~~K.~~I. How engineers communicate
~~L.~~J. Engineering calculations & applications
~~M.~~K. Defining problems
~~N.~~L. Brainstorming / Researching Designs
~~O.~~M. Modeling and testing
~~P.~~N. Stages of team development
~~Q.~~O. Introduction to Success
~~R.~~P. Academic and Professional Ethics
~~S.~~Q. Effective Time and Workload Management
~~T.~~R. Note taking, Study, and Learning Skills
~~U.~~S. Effective Textbook Usage and Exam Preparation

(continued)

~~V.~~T. Computing effectively

~~W.~~U. Self-Directed Learning and Research

Activities

~~X.~~V. Project 1: (model) Systems / Environmental

~~Y.~~W. Project 2: (prototype) Mechanical / Civil

~~Z.~~X. Project 3: (prototype) Electrical / Computer

UNIVERSITY OF NORTH CAROLINA CHARLOTTE | THE WILLIAM STATES LEE COLLEGE OF ENGINEERING

SYLLABUS

Course: **ENGR-1301 – Foundations of Math & Science for Engineers**
Credit hours: 3

Course Description

The study of foundational math and science, including vectors, vector algebra, units, Newton's laws, atomic structure, properties of matter, quantum mechanics, ideal gas law, chemical bonding, etc. Lectures and breakout practice/lab sessions.

Pre-/Co-requisites

None

Outcomes

1) Express physical quantities in the proper units (either SI or English)
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I. Atomic, Molecular and Molar Mass, Avogadro, Formulas and Composition Calculations
J. Electron Configurations
K. Chemical Bonding, Formal Charges, VSPER, Molecular Structure
L. Balancing Equations and Limiting Reactants
M. Concentration of Solutions (Molarity, Normality, Molality, Mole fraction)
N. Oxidation-Reduction, Electrochemistry, Nernst Equation
O. Properties of Solutions (Vapor Pressure, Boiling Point, Freezing Point, Osmotic Pressure)
P. Solids (crystal structures)
Q. Thermochemistry, Laws of Thermodynamics and Chemical Equilibrium, The Ideal Gas Law

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SYLLABUS

Course: **ENGR-1302 – Logic and Computational Problem Solving**
Credit hours: 3

Course Description

Examine real-world engineering problems and develop a methodology for computationally solving them. A modern programming language is introduced.

Pre-/Co-requisites

None

Outcomes

1) Introduce a problem solving mindset
~~2)~~ Identify engineering problems from each discipline and
~~3)~~2) Formulate a set of possible solutions ~~to problems~~
~~4)~~3) Apply~~Express specific~~ computational solutions to these engineering problems ~~from each discipline~~
~~5)~~4) Work on practical engineering problems that involve the use of microcontrollers (e.g. Arduino) and processing of data acquired from sensors.
~~6)~~5) Introduction to ~~generative~~ Artificial Intelligence and its applications in computational problem solving

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V. Reading / Writing / Debugging programs
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~~M.~~N. Data - analysis and manipulation
~~N.~~O. Data - representation of uncertainty
P. Data manipulation and visualization in Excel & MATLAB
~~O.~~Q. Visualizing 3D data (surface plots)