

## Duke Interdisciplinary Engineering and Applied Sciences (IDEAS) Risk, Data, and Financial Engineering Curricular Requirement Checklist

<b>Pratt's General Education Courses</b>	<b>Term</b>	<b>Grade</b>
WRITING 101		
MATH 111L or 21		
MATH 112L or 22 or 122L		
MATH 218D-2		
MATH 219		
MATH 353		
Math or Natural Science Elective from Table 4		
CHEM 101DL or 20 or 21		
PHYSICS 151L or 25		
PHYSICS 152L or 26		
<b>2 Engineering Foundations Courses</b>	<b>Term</b>	<b>Grade</b>
EGR 101 Engineering Design and Communication		
EGR 103L Computational Methods or (CS 201 Algorithms and Data Structures and AP credit in CS)		
<b>4 RDFE Track Core Courses</b>	<b>Term</b>	<b>Grade</b>
CEE 251L Uncertainty, Design, and Optimization		
CEE 351 Engineering Economics, Risk and Decision		
CEE 690 Data Science and Machine Learning in CEE		
CEE 690 Risk and Resilience Engineering		
<b>3 RDFE Engineering Electives (from Table 1)</b>	<b>Term</b>	<b>Grade</b>
<b>1 RDFE Open Elective (from Table 1 or Table 2)</b>	<b>Term</b>	<b>Grade</b>
<b>2 Engineering Science Electives (from Table 3)</b>	<b>Term</b>	<b>Grade</b>
<b>2 Independent Study or Capstone</b>	<b>Term</b>	<b>Grade</b>
Capstone Design, Independent Study or FinTech 533		
Capstone Design, Independent Study or FinTech 535		
<b>5 Social Science &amp; Humanities Electives (see Table 5)</b>	<b>Term</b>	<b>Grade</b>
<b>5 or More Free Electives (AP Credit may NOT be applied)</b>	<b>Term</b>	<b>Grade</b>

\* Track course pre-req's may satisfy eng'g sci elective or nat'l sci req's

Refer to [The Duke Undergraduate Bulletin](#) for general [requirements for all IDEAS curricula](#) and Criterion #5 of the [General Criteria for Baccalaureate Level Programs](#)

## Risk, Data, and Financial Engineering Courses

**TABLE 1: RDFE Engineering Electives**

Course Number	Title	Term	Pre-reqs
CEE 590	Calculus of Sustainability		Math 218-2
CEE 628	Uncertainty Quantification	Spring	Math 218D-2, Math 353
CEE 690	Environmental Spatial Data Analysis	Fall	EGR 103, Math 218D-2
ECE 555	Probability for Electrical Engineering	Fall	Math 218D-2
ECE 687D	Theory and Algorithms for Machine Learning		Math 218D-2, CEE 201L, EGR 305
FINTECH 5xx	FinTech 533, 535, 536, 540, 545, 564		533 and 535 can not double count as a track elective and as a capstone course
Other engineering course at 300 level or greater			approval of academic advisor and academic dean

**TABLE 2: RDFE Non-engineering Electives**

Course Number	Title	Term	Pre-reqs
Econ 204D	Econometrics and Data Science		(Econ 101, 101D or 201D) and (Econ 104D or Stat 111)
ECON 372	Asset Pricing and Risk Management	Fall or Spring	ECON 101, ECON 104D or STA 111, 230, 210, or 250, or BME 244L; and ECON 205D or Math 212, 222, or 216.
ECON 378	Financial Risk Management	Spring	Math 212, ECON 201, 205D, 210D
Energy 590	Economics of Modern Power Systems	Fall	
Math 581	Mathematical Finance	Fall	Math 212, 222, 230 or consent
MATH 582 / ECON 674	Financial Derivatives		Math 212, Math 230
Math 590	Insurance of Life, Death, Math	Spring	
STAT 230	Probability		Math 219
STAT 240L	Probability for Statistical Inference, Modeling, and Data Analysis		Math 219, not open to those with STA 230 or 231
STAT 323D	Statistical Computing	Spring	STAT 210 and (STA 230 or 240L or 231)
STAT 325L	Machine Learning & Data Mining	Spring	STAT 210 and (STA 230 or 240L or 231)
Other appropriate courses at >300 level			approval of academic advisor and academic dean

**TABLE 3: Engineering Science Electives for RDFE**

Course Number	Title	Term	Pre-reqs
BME 221L	Biomaterials		BME 244L
BME 244	Quantitative Physiology with BioStatistics		EGR 103, Math 218-2/219, Bio 201/203
BME 260L	Modeling Cellular and Molecular Systems		Bio 201, Math 219, BME 244
BME 271D	Signals and Systems		ECE 110, Math 218-2
CEE 301L or ME 336L	Fluid Mechanics	Fall & Spring	Math 353, EGR 244L(co), ME 331L (for ME 336L not CEE 301)
CEE 421L	Matrix Structural Analysis	Fall	EGR 201
CEE 461	Chemical Principles in Env. Eng'g		Chem 101
CEE 462	Biological Principles in Env. Eng'g		none
CEE 502	Data Analysis and Parameter Estimation	occasionally	
CEE 520	Continuum Mechanics	Fall	EGR 201L, Math 218-2, Math 219, Math 353
CEE 521	Elasticity and viscoelasticity	occasionally	
CEE 525	Wave Propagation in Elastic and Poroelastic Media	occasionally	
CEE 530	Finite Elements	Fall	EGR 201L
CEE 541	Structural Dynamics	occasionally	
CEE 551	Isotopes in Earth and Environmental Sci.	Fall	
CEE 560	Environmental Transport Phenomena	Fall	
CEE 563	Chemical Fate of Organic Compounds	Fall	Chem 101 and Chem 201
CEE 565	Environmental Analytic Chemistry	Spring	Undergraduate chemistry
CEE 575	Air Pollution Engineering	occasionally	
ECE 110L	Fundamentals of Electrical and Computer Engineering	Fall & Spring	MATH 112L(co) and EGR 103L(co) or COMPSCI 201(co)
ECE 230	Micro Electronic Devices and Circuits		EGR 103, Phys 152, ECE 110L
ECE 250D	Computer Architecture		CS 201
ECE 270L	Intro to Electromagnetic Fields		EGR 103, Phys 152, Math 218-2, ECE 110L
ECE 280L	Intro to Signals and Systems		ECE 110L
ECE 341L	Solar Cells		Phys 152
EGR 201L	Mechanics of Solids		Math 112, Phys 151
EGR 224L	Electrical Fundamentals of Mechatronics		EGR 103, Math 112, Phys 152
EGR 244L	Dynamics	Spring	EGR 201L, Math 212
ECE 350L	Digital Systems	Fall & Spring	ECE 250D
ME 221L	Structure and Properties of Solids		EGR 103, EGR 201, Math 219, Phy 152
ME 331L	Thermodynamics	Fall & Spring	Math 212, Phys 151L
ME 438	Constructal Theory		none

**TABLE 4: Natural Science and Math Electives for RDFE**

<b>Course Number</b>	<b>Title</b>	<b>Term</b>	<b>Pre-reqs</b>
BIO 20	AP / IB / IPC credit		
BIO 201DL	Gateway to Biology: Molecular Biology		
BIO 202DL	Genetics and Evolution		
BIO 215/215	Intro to Mathematical Modeling in Biology		
BIO 275A	Biology for Engineers: Informing Engineering Decisions (@ the Duke Marine Lab)		
BIO 311	Systems Biology: An Intro to Quantitative Science		
CHEM 201DL	Organic Chemistry I		
CHEM 202DL	Organic Chemistry II		
CHEM 210DL	Modern Application of Chemical Principles		
EOS 101	The Dynamic Earth		
EOS 102	The Dynamic Ocean		
EOS 103	Climate Change for Future Leaders		
EOS 202	Ocean and Atmospheric Dynamics		
EOS 370A	Intro to Physical Oceanography		
PHYS 264	Optics and Modern Physics		
PHYS 305	Intro to Astrophysics		
PHYS 361	Intermediate Mechanics		
PHYS 513	Nonlinear Dynamics		
Math 238L	Fundamentals of Data Analysis and Decision Science	Spring	
Math 240	Introduction to Applied Mathematics: Modeling, Equations and Proofs	occasionally	
Math 590	Insurance of Life, Death, Math	Spring	
STAT 230	Probability		Math 219
STAT 240L	Probability for Statistical Inference, Modeling, and Data Analysis		Math 219, not open to those with STA 230 or 231
STAT 323D	Statistical Computing	Spring	STAT 210 and (STA 230 or 240L or 231)
STAT 325L	Machine Learning & Data Mining	Spring	STAT 210 and (STA 230 or 240L or 231)

*Note: a course appearing in both Table 2 and Table 4 does not count toward both requirements.*

**TABLE 5: Social Science and Humanities Electives  
the “5-4-3-2-1” rule**

- **5** courses, carrying one or more of the following
- **4** SS-H areas of knowledge: FL, SS, CZ, AL, and covering ...
- **3** or more of the **4** areas of knowledge, including one or more SS course.
- **2** or more of the **5** courses must be offered from the same department
- **1** or more of the **5** courses in the same department at 200 level or above.

A maximum of 2 AP credits may be used to meet the SSH requirement.  
AP credit may not be used to meet the 200-level course requirement.

## An example RDFE course sequence (assuming no AP credit)

Year 1 Fall	Year 1 Spring
Math 111L	Math 112L
Chem 101DL	Phys 151L
EGR 103	EGR 101
Open elective 1	Writing 101

Year 2 Fall	Year 2 Spring
Math 218D-2	Math 219
Phys 152L	Engineering sci elective 2
EGR 201L or ECE 110 (Engineering sci elective 1)	CEE 251L
SSH 1	SSH 2

Year 3 Fall	Year 3 Spring
Math 353	Math or Natural Science Elective from Table 4
CEE 351	CEE 690 Risk and Resilience Engineering
RDFE engineering elective 1	Independent Study or FinTech 533 or Interdisciplinary Capstone
Open elective 2	SSH 3
Open elective 3	Open elective 4

Year 4 Fall	Year 4 Spring
Data Science and Machine Learning in CEE	RDFE engineering elective 3
RDFE engineering elective 2	RDFE open elective
Independent Study or FinTech 535 or Interdisciplinary Capstone	Open elective 5
SSH 4	SSH 5

# Duke Interdisciplinary Engineering and Applied Sciences

## Risk, Data, and Financial Engineering 4-Year Plan

Student Name: .....

Faculty Advisor: .....

### Course Scheduling Plan

Year 1 Fall	Year 1 Spring

Year 2 Fall	Year 2 Spring

Year 3 Fall	Year 3 Spring

Year 4 Fall	Year 4 Spring

<b>Meeting Date</b>				
<b>Student Initials</b>				
<b>Advisor Initials</b>				