

# Data Science, Undergraduate Certificate

The certificate program provides basic training on skills required for working in growing and popular fields involving data. The undergraduate certificate in Data Science is a five-course (15 credit hour) program. It provides both statistical and computational background while also allowing to focus on specific technologies. It provides skills, both statistical and computational, and technologies for the growing and popular fields involving data science and analysis. A student pursuing this certificate can choose from one of the two tracks, the computational track and or the statistical track. Each track consists of three required courses (9 credit hours) plus three and two additional elective courses (9 6 credit hours).

## Computational Track

### Required Courses

CMP SCI 4200	Python for Scientific Computing and Data Science	3
CMP SCI 4340	Introduction to Machine Learning	3
CMP SCI 4342	Introduction to Data Mining	3
Choose one from the following:		3
MATH 4005	Exploratory Data Analysis with R	
MATH 4200	Mathematical Statistics I	

### Electives

Select additional three courses from Choose two of the following courses:		9 6
CMP SCI 4030	Introduction to Intelligent Web	
CMP SCI 4300	Introduction to Artificial Intelligence	
CMP SCI 4320	Introduction to Evolutionary Computation	
CMP SCI 4370	Introduction to Biological Data Science	
CMP SCI 4390	Introduction to Deep Learning	
MATH 4005	Exploratory Data Analysis with R	

MATH 4090	Introduction to High-dimensional Data Analysis	
MATH 4200	Mathematical Statistics I	
MATH 4210	Mathematical Statistics II	
MATH 4220	Bayesian Statistical Methods	
MATH 4225	Introduction to Statistical Computing	
MATH 4250	Introduction to Statistical Methods in Learning and Modeling	
MATH 4260	Introduction to Stochastic Processes	
<b>Total Hours</b>		<b>15</b>

## Statistical Track

<b>Required Courses</b>		
MATH 4200	Mathematical Statistics I	3
MATH 4210	Mathematical Statistics II	
<del>Choose one from the following:</del>		
MATH 4250	Introduction to Statistical Methods in Learning and Modeling	3
or CMP SCI 4340	Introduction to Machine Learning	3

## Electives

<del>Select additional three courses from</del> Choose two of the following courses:		<del>9</del> 6
CMP SCI 4030	Introduction to Intelligent Web	
CMP SCI 4200	Python for Scientific Computing and Data Science	
CMP SCI 4300	Introduction to Artificial Intelligence	
CMP SCI 4320	Introduction to Evolutionary Computation	

CMP SCI 4340	Introduction to Machine Learning (if course not used above)	
CMP SCI 4342	Introduction to Data Mining	
CMP SCI 4370	Introduction to Biological Data Science	
CMP SCI 4390	Introduction to Deep Learning	
MATH 4005	Exploratory Data Analysis with R	
MATH 4090	Introduction to High-dimensional Data Analysis	
MATH 4220	Bayesian Statistical Methods	
MATH 4225	Introduction to Statistical Computing	
MATH 4250	Introduction to Statistical Methods in Learning and Modeling (if course not used above)	
MATH 4260	Introduction to Stochastic Processes	
Total Hours		15

~~Residency requirement: of the required six at least five must be taken at the University of Missouri – St. Louis.~~ A minimum of three courses must be taken from UMSL.  
~~Elective courses~~ Courses may be substituted with the permission of the ~~program director~~ certificate coordinator. For more information, contact the department chair or email [info@arch.umsi.edu](mailto:info@arch.umsi.edu).

#### Rationale

Changing the certificate to 15 credit hours as determined sufficient. Also adding new Python course