# MATHEMATICAL & COMPUTATIONAL SCIENCE | Stanford's DATA SCIENCE MAJOR

## Program Requirements (78-84 units)

### 2016 - 2017

### MATHEMATICS

<table>
<thead>
<tr>
<th>Math Pre-requisites</th>
<th>28 units</th>
<th>Qtr</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH</td>
<td>AP credit Calculus AB and BC exam</td>
<td>A,W,Su,S</td>
</tr>
<tr>
<td>19/20/21</td>
<td>10</td>
<td>A,W</td>
</tr>
<tr>
<td>4/142*</td>
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</tbody>
</table>

### Required Math

Select one of the following sequences:

**MATH**

- **51** Linear Algebra and Differential Calculus of Several Variables 5 A,W,S,Se
- **52** Integral Calculus of Several Variables 5 A,W,Se
- **53** Ordinary Differential Equations with Linear Algebra 5 A,W,Se

or

- **61CM** Continuous Methods I 5 A
- **62CM** Continuous Methods II 5 W
- **63CM** Continuous Methods III 5 S

or

- **61DM** Discrete Methods I 5 A
- **62DM** Discrete Methods II 5 W
- **63DM** Discrete Methods III 5 S

Select one from the following:

**MATH**

- **104** Applied Matrix Theory 3 A,W
- **113** Linear Algebra and Matrix Theory 3 A,W,Se

**CS**

- **103** Mathematical Foundations of Computing 5 A,S,Se
- **106A** Programming Methodology 5 A,W,Se,Se

and either

- **106B** Programming Abstractions 5 A,W,Se,Se

or

- **106X** Programming Abstractions (accelerated) 5 A,W

Select two from the following:

**CME**

- **108** Introduction to Scientific Computing 3 W,Se
- **107** Computer Organization & Systems 3-5 A,W,Se

**CS**

- **154** Introduction to Automata and Complexity Theory 3-4 A
- **161** Design and Analysis of Algorithms 3-5 A,W,Se,Se
- **181W** Computers, Ethics, and Public Policy (WIM) 4 W,Se

**MS&E**

- **211** Linear and Nonlinear Optimization 4 A
- **221** Stochastic Modeling 3 W

or select three from the following:

- **T11** Introduction to Optimization 4 A
- **121** Introduction to Stochastic Modeling 4 S
- **211** Linear and Nonlinear Optimization 4 A
- **221** Stochastic Modeling 3 W
- **251** Stochastic Control 3 NOT

### STATISTICS

<table>
<thead>
<tr>
<th>Statistics</th>
<th>11 - 12 units</th>
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<tbody>
<tr>
<td>STARS</td>
<td>116 Theory of Probability 5 A,S,Se</td>
</tr>
<tr>
<td></td>
<td>200 Introduction to Statistical Inference 3 A,W</td>
</tr>
</tbody>
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Select one from the following:

**STATS**

- **191** Introduction to Applied Statistics 3-4 W
- **203** Introduction to Regression Models and Analysis of Variance 3 W

### WIM

<table>
<thead>
<tr>
<th>Electives: Three (3) courses in Math &amp; Comp. Science 100-level or above; at least 3 units each from two different departments. At least one must be from following list</th>
</tr>
</thead>
<tbody>
<tr>
<td>102C Advanced Topics in Econometrics 5 W</td>
</tr>
<tr>
<td>107  Causal Inference and Program Evaluation 5 NOT</td>
</tr>
<tr>
<td>140  Introduction to Financial Economics 5 S,Se</td>
</tr>
<tr>
<td>160  Game Theory and Economic Applications 5 A</td>
</tr>
<tr>
<td>179  Experimental Economics 5 NOT</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>MATH</th>
<th>106A Applied Matrix Theory 3 A,W</th>
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<tbody>
<tr>
<td>104B Programming Abstractions 5 A,W,Se,Se</td>
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Select three from the following:

**MATH**

- **109** Applied Group Theory 3 S
- **110** Applied Number Theory and Field Theory 3 A
- **120** Groups and Rings 3 A,Se
- **171** Fundamental Concepts of Analysis 3 A,Se
- **181W** Computers, Ethics, and Public Policy 4 W,Se

**STATS**

- **155** Statistical Methods in Computational Genetics (Instr. Perm. Req.) 3 A

**CS**

- **221** Artificial Intelligence: Principles and Techniques 3-4 A
- **223A** Introduction to Robotics 3 W
- **225A** Experimental Robotics 3 S
- **228** Probabilistic Graphical Models: Principles and Techniques 3-4 W
- **229** Machine Learning 3-4 A,Se
- **243** Program Analysis and Optimizations 3-4 W
- **246** Mining Massive Data Sets 3-4 W

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Note: Course scheduling subject to change. See Stanford Bulletin. All courses used to fulfill major requirements must be taken for a letter grade with the exception of courses offered satisfactory/no credit only.

*(MATH 41/42 will not be offered starting 2017-18.)*