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**Research Prerequisites:**

Research methods: An engineering approach on EDX:

Link: <https://www.edx.org/course/research-methods-engineering-approach-witsx-elen7070x-0>

**Math Pre Requisites: Video Lectures:**

|  |  |  |
| --- | --- | --- |
| [18.01SC](https://ocw.mit.edu/courses/mathematics/18-01sc-single-variable-calculus-fall-2010) | [Single Variable Calculus (Fall 2010)](https://ocw.mit.edu/courses/mathematics/18-01sc-single-variable-calculus-fall-2010) | [Undergraduate](https://ocw.mit.edu/courses/mathematics/18-01sc-single-variable-calculus-fall-2010) |
| [18.02SC](https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010) | [Multivariable Calculus (Fall 2010)](https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010) | [Undergraduate](https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010) |
| [18.03SC](https://ocw.mit.edu/courses/mathematics/18-03sc-differential-equations-fall-2011) | [Differential Equations (Fall 2011)](https://ocw.mit.edu/courses/mathematics/18-03sc-differential-equations-fall-2011) | [Undergraduate](https://ocw.mit.edu/courses/mathematics/18-03sc-differential-equations-fall-2011) |
| [18.06SC](https://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall-2011) | [Linear Algebra (Fall 2011)](https://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall-2011) | [Undergraduate](https://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall-2011) |
| [6.041SC](https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041sc-probabilistic-systems-analysis-and-applied-probability-fall-2013) | [Probabilistic Systems Analysis and Applied Probability (Fall 2013)](https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041sc-probabilistic-systems-analysis-and-applied-probability-fall-2013) | [Undergraduate](https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041sc-probabilistic-systems-analysis-and-applied-probability-fall-2013) |

 Very Important Note:

1.        Please note, Scalability of the system is not covered here. A significance amount of distributed computing, Parallel computing, Special Chip (GPU, FPGA,TPU), HPC.  Computer vision is also another major core course which is not included yet. Another few week, will add a scalable system and CV (Computer Vision) topics. More advanced topic like Context Computing, Cognitive Computing, Affective Computing  etc. will covered in advanced separate courses.Also please note,  a special emphasize of various data-base, programming paradigm and algorithm design and complexity theory should also be considered as prerequisite for non- computer science candidate.

**Core Courses:**

Probability:

Information Theory I and II : Jeffery Bilmes ( University of Washington on YouTube )  
Link: <https://www.youtube.com/channel/UCvPnLF7oUh4p-m575fZcUxg/videos>

Discrete stochastic processes : 6.262 OCW MIT  
Link : <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-262-discrete-stochastic-processes-spring-2011/>

PGM by Daphne Koller : <https://www.coursera.org/specializations/probabilistic-graphical-models>

Graphical Model Inference: Jeffery Bilmes (University of Washington on YouTube)\  
Link: <https://www.youtube.com/channel/UCvPnLF7oUh4p-m575fZcUxg/videos>

Optimization:

Linear dynamical systems: Stephen Boyd (YouTube)  
Link : <https://www.youtube.com/watch?v=bf1264iFr-w&list=PL3B290781CFFBC23F>

Convex Optimization: Stephen Boyd (YouTube)  
Link: <https://www.youtube.com/watch?v=McLq1hEq3UY&list=PL3940DD956CDF0622>

Link : <https://web.stanford.edu/~boyd/cvxbook/>

Machine learning and Pattern Recognition:

Introduction to Machine learning: Andrew NG Coursera  
Link : <https://www.coursera.org/learn/machine-learning>

Book : Kevin Murphy  
Link : <https://mitpress.mit.edu/books/machine-learning-0>

Book : Christopher Bishop  
Link : <https://www.microsoft.com/en-us/research/people/cmbishop/>

CA Murthy Lectures on YouTube / Book : Duda Hart Strok  
Link : <https://www.youtube.com/watch?v=mfePdDh9t6Q&list=PLbMVogVj5nJQJMLb2CYw9rry0d5s0TQRp>

Artificial Intelligence :

AI : 6.034 OCW MIT ( Patrick Winston )  
Link : <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/>  
Book : <http://aima.cs.berkeley.edu/>

Deep Learning:

Neural Networks by Geoffrey Hinton on Coursera  
Link : <https://www.coursera.org/learn/neural-networks>

Book : Ian Good fellow  
Link : <http://www.deeplearningbook.org/>

Deep Learning Oxford: Nando de Freitas on YouTubeLink : <https://www.youtube.com/watch?v=PlhFWT7vAEw>

New cpurses of Andres Ng for Deep Learning specializatsion at courser ( must look course ):  
Link: <https://www.coursera.org/specializations/deep-learning>

Reinforcement Learning:   
Richard Sutton Book ( please have look at online draft along with code and presentations ) :  
Link : <http://incompleteideas.net/sutton/book/the-book-2nd.html> 

NLP:

NLP: Stanford Courses by Dan Jurafsky and C. Manning  
<https://www.youtube.com/watch?v=nfoudtpBV68&list=PL6397E4B26D00A269>

Deep Learning for NLP: CS224D on you tube and course page.  
Link : <https://www.youtube.com/watch?v=OQQ-W_63UgQ&list=PL3FW7Lu3i5Jsnh1rnUwq_TcylNr7EkRe6>  
Link : <https://web.stanford.edu/~jurafsky/NLPCourseraSlides.html>  
Book : <https://web.stanford.edu/~jurafsky/slp3/>  
Book : <https://nlp.stanford.edu/fsnlp/promo/>

Total 20 Video Courses and 6 Main Books.

**Expected Duration**: 6 to 18 Months for Course Completion. The ideal time to complete this program can be completed is in 1 year.

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