

## COMPUTATION AND COGNITION (COURSE 6-9P)

Computation and Cognition (<http://catalog.mit.edu/interdisciplinary/graduate-programs/computation-cognition>)

### Master of Engineering in Computation and Cognition

The Master of Engineering degree is awarded only to students who have already received, or who will simultaneously receive, the Bachelor of Science in Computation and Cognition (Course 6-9). Refer to the undergraduate degree chart (<http://catalog.mit.edu/degree-charts/computation-cognition-6-9>) for requirements.

The graduate component of the MEng program is described below.

#### Course 6-9P Graduate Requirements

##### Required Subjects

6.THM	Master of Engineering Program Thesis	24
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##### Restricted Electives

Four graduate subjects totaling at least 42 units, which includes two subjects from the EECS advanced subjects and two from the BCS advanced subjects	42-48
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Two subjects from the list of mathematics restricted electives	24
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<b>Total Units</b>	<b>90-96</b>
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##### EECS Advanced Subjects

6.2532	Nanoelectronics	12
6.4400	Computer Graphics	12
6.4812[[]]	Cellular Neurophysiology and Computing	12
6.4822[[]]	Quantitative Physiology: Organ Transport Systems	12
6.4832[[]]	Fields, Forces, and Flows in Biological Systems	12
6.4842[[]]	Molecular, Cellular, and Tissue Biomechanics	12
6.4861[[]]	Medical Device Design	12
6.5080	Multicore Programming	12
6.5110	Foundations of Program Analysis	12
6.5150	Large-scale Symbolic Systems	12
6.5160[[]]	Classical Mechanics: A Computational Approach	12
6.5210[[]]	Advanced Algorithms	12
6.5220[[]]	Randomized Algorithms	12
6.5230	Advanced Data Structures	12
6.5250[[]]	Distributed Algorithms	12

6.5310	Geometric Folding Algorithms: Linkages, Origami, Polyhedra	12
6.5320	Geometric Computing	12
6.5340	Topics in Algorithmic Game Theory	12
6.5400[[]]	Theory of Computation	12
6.5410[[]]	Advanced Complexity Theory	12
6.5420	Randomness and Computation	12
6.5430	Quantum Complexity Theory	12
6.5610	Applied Cryptography and Security	12
6.5620[[]]	Cryptography and Cryptanalysis	12
6.5630	Advanced Topics in Cryptography	12
6.5660	Computer Systems Security	12
6.5810	Operating System Engineering	12
6.5820	Computer Networks	12
6.5830	Database Systems	12
6.5840	Distributed Computer Systems Engineering	12
6.5900	Computer System Architecture	12
6.5910	Complex Digital Systems Design	12
6.5920	Parallel Computing	12
6.6010	Analysis and Design of Digital Integrated Circuits	12
6.6020	High Speed Communication Circuits	12
6.6220	Power Electronics	12
6.6280	Electric Machines	12
6.6300	Electromagnetics	12
6.6310	Optics and Photonics	12
6.6370	Optical Imaging Devices, and Systems	12
6.6400	Applied Quantum and Statistical Physics	12
6.6420[[]]	Quantum Information Science	12
6.6500[[]]	Integrated Microelectronic Devices	12
6.6510	Physics for Solid-State Applications	12
6.6520	Semiconductor Optoelectronics: Theory and Design	12
6.6530	Physics of Solids	12
6.6600[[]]	Nanostructure Fabrication	12
6.6630[[]]	Control of Manufacturing Processes	12
6.7000	Discrete-Time Signal Processing	12
6.7010	Digital Image Processing	12
6.7020	Array Processing	12
6.7100[[]]	Dynamic Systems and Control	12
6.7110	Multivariable Control Systems	12
6.7200[[]]	Optimization Methods	12
6.7210[[]]	Introduction to Mathematical Programming	12

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6.7220[[]]	Nonlinear Optimization	12
6.7230[[]]	Algebraic Techniques and Semidefinite Optimization	12
6.7240	Game Theory with Engineering Applications	12
6.7260	Network Science and Models	12
6.7300[[]]	Introduction to Modeling and Simulation	12
6.7310[[]]	Introduction to Numerical Methods	12
6.7310[[]]	Introduction to Numerical Methods	12
6.7320[[]]	Parallel Computing and Scientific Machine Learning	12
6.7330[[]]	Numerical Methods for Partial Differential Equations	12
6.7340[[]]	Fast Methods for Partial Differential and Integral Equations	12
6.7410	Principles of Digital Communication	12
6.7420	Heterogeneous Networks: Architecture, Transport, Protocols, and Management	12
6.7430	Optical Networks	12
6.7440	Principles of Wireless Communication	12
6.7450[[]]	Data-Communication Networks	12
6.7460	Essential Coding Theory	12
6.7700[[]]	Fundamentals of Probability	12
6.7710	Discrete Stochastic Processes	12
6.7720[[]]	Discrete Probability and Stochastic Processes	12
6.7800	Inference and Information	12
6.7810	Algorithms for Inference	12
6.7830	Bayesian Modeling and Inference	12
6.7900	Machine Learning	12
6.7910[[]]	Statistical Learning Theory and Applications	12
6.7910[[]]	Statistical Learning Theory and Applications	12
6.7940	Dynamic Programming and Reinforcement Learning	12
6.8110[[]]	Cognitive Robotics	12
6.8210	Underactuated Robotics	12
6.8300	Advances in Computer Vision	12
6.8320	Advanced Topics in Computer Vision	12
6.8370	Advanced Computational Photography	12
6.8410	Shape Analysis	12
6.8420	Computational Design and Fabrication	12

6.8510	Intelligent Multimodal User Interfaces	12
6.8610	Quantitative Methods for Natural Language Processing	12
6.8620[[]]	Spoken Language Processing	12
6.8630[[]]	Natural Language and the Computer Representation of Knowledge	12
6.8700[[]]	Advanced Computational Biology: Genomes, Networks, Evolution	12
6.8710[[]]	Computational Systems Biology: Deep Learning in the Life Sciences	12
6.8800[[]]	Biomedical Signal and Image Processing	12
6.8830[[]]	Signal Processing by the Auditory System: Perception	12
6.9350[[]]	Financial Market Dynamics and Human Behavior	9

<sup>1</sup> Cannot count as EECS Advanced Subject if undergraduate version is taken as part of the Course 6-9 SB degree.

**BCS Advanced Subjects**

9.016[[]]	Introduction to Sound, Speech, and Hearing	12
9.021[[]]	Cellular Neurophysiology and Computing <sup>1</sup>	12
9.073[[]]	Statistics for Neuroscience Research <sup>2</sup>	12
9.110[[]]	Nonlinear Control	12
9.123[[]]	Neurotechnology in Action	12
9.181[[]]	Developmental Neurobiology <sup>1</sup>	12
9.190	Computational Psycholinguistics <sup>1</sup>	12
9.272[[]]	Topics in Neural Signal Processing	12
9.285[[]]	Audition: Neural Mechanisms, Perception and Cognition	12
9.301[[]]	Neural Plasticity in Learning and Memory	9
9.34[[]]	Biomechanics and Neural Control of Movement	12
9.422[[]]	Principles of Neuroengineering	12
9.455[[]]	Revolutionary Ventures: How to Invent and Deploy Transformative Technologies	9
9.520[[]]	Statistical Learning Theory and Applications <sup>1</sup>	12
9.530	Emergent Computations Within Distributed Neural Circuits <sup>1</sup>	12
9.583[[]]	Functional Magnetic Resonance Imaging: Data Acquisition and Analysis	12

9.660	Computational Cognitive Science <sup>1</sup>	12
9.822[J]	Psychology and Economics	12
24.949	Language Acquisition I	9

<sup>1</sup> Cannot count as BCS Advanced Subject if undergraduate version is taken as part of the Course 6-9 SB degree.

<sup>2</sup> Subject can count as BCS Advanced Subject or Mathematics Restricted Elective, but not both.

### **Mathematics Restricted Electives**

#### **Probability and Statistics (maximum of 1)**

6.3700	Introduction to Probability <sup>1</sup>
6.3800	Introduction to Inference <sup>1</sup>
6.7700[J]	Fundamentals of Probability
9.07	Statistics for Brain and Cognitive Science <sup>1</sup>
9.073[J]	Statistics for Neuroscience Research <sup>2</sup>
9.272[J]	Topics in Neural Signal Processing <sup>2</sup>
18.05	Introduction to Probability and Statistics
18.600	Probability and Random Variables
18.650[J]	Fundamentals of Statistics

#### **Discrete Mathematics (maximum of 1)**

6.1200[J]	Mathematics for Computer Science <sup>1</sup>
18.200	Principles of Discrete Applied Mathematics

#### **Linear Algebra (maximum of 1)**

18.06	Linear Algebra <sup>1</sup>
18.703	Modern Algebra

#### **Complex Variables (maximum of 1)**

18.04	Complex Variables with Applications
18.0751	Methods for Scientists and Engineers

#### **Real Analysis (maximum of 1)**

18.1001	Real Analysis
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#### **Other Subjects**

8.044	Statistical Physics I
18.0851	Computational Science and Engineering I
18.0861	Computational Science and Engineering II
18.330	Introduction to Numerical Analysis
18.781	Theory of Numbers

<sup>1</sup> Cannot count as Mathematics Restricted Elective if taken as part of the Course 6-9 SB degree.

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