COMPUTER ENGINEERING (CENG-SHU)

CENG-SHU 201 Digital Logic (4 Credits)
Typically offered Fall
This module provides a rigorous introduction to topics in digital logic design. Introductory topics include: classification of digital systems, number systems and binary arithmetic, error detection and correction, and switching algebra. Combinational design analysis and synthesis topics include: logic function optimization, arithmetic units such as adders and subtractors, and control units such as decoders and multiplexers. In-depth discussions on memory elements such as various types of latches and flip-flops, finite state machine analysis and design, random access memories, FPGAs, and high-level hardware description language programming such as VHDL or Verilog. Timing hazards, both static and dynamic, programmable logic devices, PLA, PAL and FPGA will also be covered. Prerequisite: Intro to Programming or Intro to Computer Science or placement test or interaction lab. Fulfillment: Core Curriculum: Science Experimental Discovery in the Natural World Courses ; Major: CS Electives, CE Required, EE Required.
Grading: Ugrd Shanghai Graded
Repeatable for additional credit: No
- SB Crse Attr: NYU Shanghai: Computer Science Elective
- SB Crse Attr: NYU Shanghai: Computer Systems Engineering Elective
- SB Crse Attr: NYU Shanghai: Electrical and Systems Engineering Required
- SB Crse Attr: NYU Shanghai: Experimental Discovery in the Natural World

CENG-SHU 202 Computer Architecture (4 Credits)
Typically offered Spring
The main ambition of this course is to teach you how a modern computer works, starting from its most elementary components (transistors, resistors, capacitors) and then climbing up the ladder of abstraction to reach a high-level programming language like C and its compilation in machine code. In this excursion, we will learn (among other things) how to turn electrons into digital logic, how to make machine instructions execute faster through pipelining and prediction, and how to organize memory in hierarchies in order to make it more efficient. Since the only way to learn computer architecture is by practicing it, we will design a register transfer level (RTL) implementation of a MIPS-like processor in Verilog, and implement a simulator of the very same architecture in C. Preliminary syllabus of the course. General introduction to the course Dataflow and parallelism From silicon to transistors The digital abstraction Number systems Programming in C: basic types and control flow Programming in C: arrays, strings and functions Programming in C: pointers, structures and unions Programming in C: linked lists and beyond Programming in C: the Unix System interface Boolean logic Karnaugh maps Latches and flip-flops Finite state machines Binary and Synchronous Decision Diagrams Programming and simulating in Verilog [part I] Programming and simulating in Verilog [part II] Digital building blocks Compilation from C to MIPS Single-cycle micro-architectures Multi-cycle micro-architectures Pipelining and dependence hazards Out-of-order execution Memory hierarchies and cache Virtual memory Memory models and multiprocessor programming Equivalency: This course counts for CSCI-UA 201 Computer Systems Organization. Prerequisite: CSCI-SHU 101 ICDS or CSCI-SHU 11 ICP or INTM-SHU 101 interaction Lab. Fulfillment: Major: CS Required, CE Required.
Grading: Ugrd Shanghai Graded
Repeatable for additional credit: No
- SB Crse Attr: NYU Shanghai: Computer Science Required
- SB Crse Attr: NYU Shanghai: Computer Systems Engineering Required

CENG-SHU 352 Emerging Technologies for Smart Cities (4 Credits)
Nowadays, many smart cities are being developed around the world. This is an undergraduate-level course to introduce a series of emerging technologies for smart cities. This course offers students fresh materials and case studies to expand their horizon on smart cities; helps them understand the functions and identify the limitations of various emerging technologies used in the smart city; and explore a set of analysis techniques on analyzing the smart city systems. Topics involve electric vehicles, connected and autonomous vehicles, ride-sourcing services, car-sharing services, bike-sharing services, on-demand services, advanced parking management, smart traffic signals, and smart grids. Prerequisite: None. Fulfillment: Core Curriculum Science Science, Technology and Society Courses; Social Science Focus Urban Studies 200 level.
Grading: Ugrd Shanghai Graded
Repeatable for additional credit: No
- SB Crse Attr: NYU Shanghai: Science, Technology and Society
- SB Crse Attr: NYU Shanghai: Social Science Focus Urban Studies

CENG-SHU 400 Senior Capstone Design Project I (4 Credits)
Typically offered Spring
Prerequisite: Senior Standing.
Grading: Ugrd Shanghai Graded
Repeatable for additional credit: No

CENG-SHU 401 Senior Capstone Design Project II (4 Credits)
Typically offered occasionally
Prerequisite: CENG-SHU 400.
Grading: Ugrd Shanghai Graded
Repeatable for additional credit: No

CENG-SHU 997 Computer Systems Engineering Independent Study (2-4 Credits)
Typically offered Fall and Spring
Students majoring in computer system engineering are permitted to work on an individual basis under the supervision of a full-time faculty member in the department if they have maintained an overall GPA of 3.0 and a GPA of 3.5 in computer system engineering and have a study proposal that is approved by a computer system engineering professor. Students are expected to spend about two to three hours a week per credit on their project.
Grading: Ugrd Shanghai Graded
Repeatable for additional credit: Yes