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Best systems engineering master's programs

2100 accredited US Universities for Graduate Programs. 400+ specializations. 1400 No GRE, GMAT schools for the Master's program 700+ Graduate scholarships totaling $3.5 mm Engineers basically have superpowers. Not in the "bitten by radioactive spider" kind of way, but in the way that they make incredible things possible. Modern life functions because engineers make it happen, and that's something few fields can boast. Systems engineers are an important subset of an already important group of people. As the University of Florida puts it, "Systems Engineers make organized work and human effort more effective and efficient for industry, education, and science." Systems engineering touches just about everything we use today, which means people who have "the technical knowledge to design cutting-edge systems and the skills to maintain them in an increasingly complex, globally interconnected business and policy environment," as Stevens Institute of Technology says, are very much in demand. They need to have a variety of skills and a deep understanding of technical processes, and they need to understand all aspects of them—the economic, environmental, managerial, technical, and political, as the University of Virginia notes. Enter the master's degree in systems engineering. Roughly 1,800 of them were conferred in 2017-2018, accounting for 25% of the 7,247 engineering master's degrees awarded that same year. Applications of the degree exist across fields and job titles. UVA notes its graduates become professors at universities; researchers at institutes and labs; analysts at corporations, consulting firms, and government agencies; and entrepreneurs. Jobs like systems engineer (obviously), systems architect, lead engineer, logistics operation manager, and project manager, among many others, can be attained with a master's in systems engineering, according to the Stevens Institute of Technology. The programs included in the 10 best master's in systems engineering are a mixture of on-campus and online learning, with some offering a hybrid of the two. They run as short as a year (of full-time study) to three or more, depending on the course load. Some are designed for full-time students, and others offer more flexible options for working professionals looking to advance their careers with another degree. All of the programs describe themselves as multidisciplinary, as systems engineering itself draws from different areas—it's not just nuts and bolts engineering, but a blend of engineering know-how with business and management principles so students can understand the practical aspects of the complex systems that will be their focus. So don't be surprised to find hardcore advanced mathematics next to something like Managing New Business Development in the curriculum. Also don't expect to have to write a thesis; not every program requires one, and those that do often allow students to choose between that and a research project. Several programs make theses completely optional, and recommend them only for people who intend to pursue a doctorate after they earn their master's. The average cost for programs in our top 10 is $26,363 per academic year, a number we tabulate using tuition as a base and factoring in financial aid opportunities. The median cost for the 10 best master's in systems engineering is $27,067, with tuition topping out at $39,862 on the high end and $11,313 on the low. See Also:10 Best Master's in Industrial Engineering Common Application and Admission Questions Engineering doesn't have a reputation as an easy field of study, so it follows that things only grow more challenging as schooling gets more advanced. Unsurprisingly, many of the programs in our top 10 require some amount of undergraduate work in engineering. A few require an undergraduate degree in engineering or a related field, and some may require, or simply prefer, certain coursework in areas like calculus, algebra, programming, or basic engineering. Johns Hopkins University (No. 3 on our list) not only requires an undergraduate degree in a science or engineering field—with a minimum 3.0 GPA—but it also requires at least a year of full-time work experience. Beyond the bachelor's, applications will usually need to have letters of recommendation, a personal statement, résumé, an application fee, and—for foreign students—proof of English proficiency (usually via TOEFL scores). Graduate standardized tests like the GRE and GMAT aren't required across the board, and many universities treat them as supplemental if they pay attention to them at all. But good GRE/GMAT scores can help tip an acceptance in your favor, especially if another part of your application—undergrad GPA or coursework, for example—is a little weaker. Speaking of GPA, many universities have a minimum threshold for undergraduate coursework, usually in the range of 3.0, but sometimes 2.7 or 2.5, that they require for admission. Once in a master's program, expect to have to maintain a 3.0 GPA or better to stay in it. Beyond that, universities often limit how low grades can get in individual courses. At Johns Hopkins, master's students are only allowed to get one C throughout their studies. (The point of this so far: Johns Hopkins doesn't mess around.) The application process can vary considerably. Some schools accept applications only once or twice a year, whereas others offer starting points with every term and thus accept applications at multiple points throughout the year. If it's an online program, chances are it has rolling admissions and numerous times during the year to begin studies. Those are usually geared toward working adults, and thus are the most accommodating for students. Online programs are offered asynchronously (coursework completed on your schedule, with regular deadlines) and synchronously (meeting a specified time for each class), or sometimes a mixture of both. They're usually complemented by regular online interactions in the form of group chats, Q&As with an instructor, or group projects to mimic traditional classroom-based instruction and help students feel less isolated. Online students also enjoy the same perks as their on-campus counterparts in the form of career and academic counseling, library services, and IT support. None of the programs among the 10 best master's in systems engineering are offered exclusively online, but as an option for study. UVA (No. 2) has a weekend-learning program, and MIT (No. 5) a commuter option. That's all to say that a traditional, drop-everything-else-and-study-for-the-next-two-years master's program isn't the only option; in fact, the more forward-thinking universities have figured out ways to accommodate people who can't afford or simply don't have that option. What About Financial Aid & Scholarships? The National Center for Education Statistics estimates the average cost of a master's degree to be $25,000, which tracks with the $26,363 average for our top 10 systems engineering programs. For 99% of the world, that's a lot of money to spend every year, especially if you're a full-time student and don't have money coming in. Financial aid is the lifeline that makes higher education attainable. According to the NCES, 70.4% of master's students receive some kind of financial aid, with the average amount being $17,400. They get their money via loans (57.1%), grants (32.5%), and other means (10.4%), though the NCES doesn't specify what "other" means. Plasma donation? Rich relatives? Doing a few last jobs as a hired assassin to save money before going straight with a systems engineering master's, only to find it nearly impossible to escape the criminal syndicate that provided your livelihood and now doesn't like having loose ends out in the world? And that call from a number in Brussels, what did they mean by "liquidate"? Wait, where were we? Oh right, financial aid. There are a few places to begin. First, if you're employed, it's a good idea to check if your company offers educational stipends or other assistance with schooling, particularly if you already work in engineering. If you're a veteran or active-duty military, the Post-9/11 GI Bill can help cover educational costs, and universities will often have programs geared toward attracting members of the military. (In fact, U.S. News and World Report has a whole separate category for Best Colleges for Veterans.) Anyone seeking financial aid needs to check out the U.S. Department of Education's Federal Student Aid website, which offers a ton of information and does an excellent job explaining the different types of financial aid, how to apply and the process of applying for it, and an especially comprehensive overview of student loans that is essential reading for anyone planning to attend a university. (Its loan simulator is a great tool.) The site offers different sections depending on where you are in life: going to college for the first time, about to graduate, currently repaying loans, in danger of falling behind on repayments, etc. It's a wealth of information that will help anyone have a good understanding of the whole world of financial aid in a short amount of time. The most important part of the Federal Student Aid website is the Free Application for Federal Student Aid, which will specify the types of student aid you qualify for. For a quick estimate, check out the site's FAFSA4caster, which offers a preview of what could come back with your application. Scholarships and grants are the most desirable types of financial aid, primarily because you don't have to pay them back. Scholarships are awarded based on merit and grants on need. A good place to look for them is the U.S. Department of Labor's scholarship finder, which has information about more than 8,000 scholarships, fellowships, grants, and more. The majority of those listings are geared toward undergraduates, simply because there are far more of them than graduate students, but the listings still boast nearly 3,000 opportunities for people heading to grad school. Finally, look to universities themselves. Many will include financial aid analysis with your application, and chances are the schools offer their own scholarships and grants to qualifying students. The state where you live likely has its own scholarships, as does private industry—particularly the many, many industries where engineering plays a key role. For further guidance in all things systems engineering—from educational programs to jobs and more—check out the International Council on Systems Engineering. How Much Can I Make With a Systems Engineering Master's? The National Center for Education Statistics shows a median salary of people with a master's degree of $70,330, though 28% of master's graduates earn more than $100,000 a year. That's a broad brush, though, and master's degrees come in a lot of varieties, with hardly the same amount of earning power. Glassdoor estimates an average systems engineer base salary of $77,768, and PayScale says $79,835. Employment site Indeed says $102,191, while its competitor ZipRecruiter says $91,790. The authoritative-sounding salary.com says the median salary is $69,486, with the top 10% bringing in $82,928. Six different sites, six different decades of numbers. Who's correct? Usually the best place to check for salary data is the U.S. Bureau of Labor Statistics, which is part of the U.S. Department of Labor. But the BLS doesn't have discrete data for systems engineers, whom it doesn't track as a group, unlike electrical and electronics engineers, mechanical engineers, civil engineers, and the like. Its general data for engineers in 2016 finds a median wage of $91,010, with an estimated 139,300 new engineering jobs to be added through 2026. The closest analog to a systems engineer in the BLS data is probably industrial engineers, whom the BLS describes as devising "efficient systems that integrate workers, machines, materials, information, and energy to make a product or provide a service." It lists $91,630 as an average salary, with the top 10% earning $132,340 and the low earners bringing in $56,470. Through 2028, the BLS estimates a job growth rate of 8%—higher than the national average of 5%—meaning an additional 23,800 positions will join the 284,600 already out there. Those are great numbers, even if industrial engineers aren't exactly the same thing as systems engineers. Another group that shows up in the BLS as related to systems engineers are electrical and electronics engineers, whom it describes as working in "research and development, engineering services, manufacturing, telecommunications, and the federal government" to "design, develop, test, and supervise the manufacture" of electrical and electronic equipment. Although a systems engineer could certainly work in that environment, it's not necessarily applicable to all systems engineering jobs. Still, the BLS estimates they make an average salary of $101,600 and an anticipated growth rate of only 2% through 2028—roughly half the national average. If salary data feels a little scattershot, that's the nature of systems engineering, which informs other types of engineering but doesn't necessarily draw a lot of attention to itself. A graphic on the website for the International Council on Systems Engineering puts it well: In the center is a yellow oval with "Systems Engineering" on it linking out to 16 rectangles around it marked "mechanical engineering," "human factors engineering," "aeronautical engineering," and more. "Systems engineers bring a particular perspective to the engineering process… that serves to organize and coordinate other engineering activities." So other engineers had better recognize. What Are the Best Systems Engineering Degrees? We know that you have educational goals that you're itching to pursue, but you may not know where to start. The editors of Master's Programs Guide utilize a unique ranking methodology based on the following five aspects: 25% Overall Degree Affordability: Average cost of undergraduate and graduate tuition per school 25% Graduation Rate: Number of students who start at the university and actually finish there 20% Earnings Potential: Average mid-career salary of school alumni 20% Selectivity: The number of students who apply versus the number who actually get accepted 10% Online Graduate Offerings: The number of programs offered online in each department At Master's Programs Guide, we strive to do our best to guide you and your family toward a fruitful academic career. The pursuit of knowledge is a noble one, and we want to help you reach your goals. Check out our ranking of the 10 best master's in systems engineering! #1. University of Florida Master of Science/Master of Engineering in Industrial & Systems Engineering Despite its reputation as a national punch line for the many shenanigans of the "Florida Man," the state of Florida has three schools among the top five largest universities in the U.S. by enrollment. The University of Florida takes the five spot, with more than 52,000 students, according to Worldatlas. Considering the university's size, it's perhaps not surprising the Department of Industrial and Systems Engineering offers four versions of its master's in industrial and systems engineering, which itself comes in two varieties: Master of Science (with or without thesis) and Master of Engineering (with or without thesis), which requires an undergraduate degree in engineering. From there, students have four options: a traditional 30-hour degree earned on campus in Gainesville, FL; a 31-hour program taken online; a 31-hour MS-only program for students from the Eglin Air Force Base community; and the outreach engineering management program for working professionals with a concentration in engineering management. Students opting for a thesis can expect to earn three to six hours of credit for their work. Phew. The Department of Industrial & Systems Engineering describes the degree as "focusing on data analysis and modeling methods" where students "develop world-class capabilities in process, system, and human performance measurement, optimization modeling, and methods design and implementation." Along the way, they'll be exposed to various application areas for ISE, such as human systems, health systems, production systems, transportation systems, and others. And with its numerous options for earning the degree, the university clearly wants to accommodate every type of learner. On-campus students must take three foundation courses, no matter their degree choice: Deterministic Methods in Operations Research (only available in the fall), Applied Probability Methods in Engineering (ditto), and a one-credit graduate seminar. Non-thesis students also take one of nine so-called "project courses" toward the end of their studies, such as Digital Simulation Techniques, Systems Design, Model Health Systems Engineering, Principles of Manufacturing Systems Engineering, and others. Online learners have a slightly different structure, which begins with five core courses that include Deterministic Methods and Applied Probability Methods above, along with others in systems design, architecture, and management. From there they take 15 credits of electives of their choice, along with one project course. Among the high-level courses included in the IGE curriculum are Manufacturing Management, Web-Based Decision Support Systems for Industrial and Systems Engineers, Models for Supply Chain Management, Fund Math Programming, and Stochastic Modeling and Analysis. Throughout it all, students must maintain a cumulative GPA of 3.0 or better. Admission into UF's program requires transcripts, a statement of purpose, résumé, GRE scores, and three letters of recommendation or references. The program offers start dates in the summer and fall. When it comes to tuition, Florida comes cheap: $11,313, less than half the list average of $26,363. #2. University of Virginia Master of Science/Master of Engineering in Systems Engineering Ranked No. 28 in National Universities and No. 41 for Best Engineering Schools by U.S. News and World Report, UVA is well known as one of the great American public universities. That probably has a lot to do with its history, seeing as how it's the brainchild of a Founding Father: Thomas Jefferson founded the school in 1819 and considered it one of his life's great achievements. His headstone calls him the "Father of the University of Virginia," but doesn't mention that he was also, you know, the president of the United States. UVA clearly held a special place in his heart, as it does for many of the people who attend it. The university notes that the research it conducts attracts potential graduate students. Currently its faculty are working on an artificial pancreas, a new generation of air-traffic control systems, and software security for autonomous vehicles. Students earning their MS in systems engineering may get the opportunity to work on some of that research. Like some other programs on our list, UVA's Department of Engineering Systems and Environment offers two types of engineering master's: an MS and an ME. The MS degree is research-based, requires a thesis, and isn't available online, while the ME has a supervised research project and can be completed online or via UVA's weekend-learning program. Their curriculum tracks also differ. As UVA describes, ME students begin with the fundamentals of systems analysis, design, and integration, then apply it to a project. MS students also start with fundamentals, but of systems, decision, and information sciences, then apply that knowledge to a more focused research project (usually one already in progress at the department) that culminates with a thesis. The ME program lasts 12 months and requires 30 credit hours to graduate: nine hours of core courses (such as Introduction to Systems Analysis and Design, Stochastic Modeling, and Optimization Models and Methods) and 21 hours of electives. UVA describes MS students as those "wishing not only to acquire fundamental knowledge, but also contribute to the advancement of knowledge through independent, original research." It has five components: core courses, electives, colloquium, research, and participation ("in the intellectual life of the University," declares the website). That translates to 32 credit hours: nine hours of core courses, 15 of electives, two hours of Systems Engineering Colloquium, and six or more hours for their thesis. To graduate, MS students must author or co-author at least one manuscript of a technical paper in addition to their thesis. In short, UVA's MS in systems engineering program does not play. That said, the university's admission requirements aren't especially daunting. Applicants will need transcripts, three letters of recommendation, and a statement of purpose essay. GRE scores are optional for the MS and not required for the ME, unless you attended a university outside of the United States. UVA's tuition is also reasonable, $17,845, well below the average for the 10 best master's in systems engineering. #3. Johns Hopkins University Master of Science in Systems Engineering The systems engineering website for Johns Hopkins leads with a vaguely Westworld-esque photo of a robotic arm and hand clutching what looks like a walkie-talkie. Or is it a detonator? If it's a walkie-talkie, why does a robot need one? And who's on the other end? Maybe these are the kinds of questions that get answered in the university's systems engineering program, or maybe the photo is only there to get people's wheels spinning. Human-computer interaction is listed as one of the topics covered in the program, after all. (So wait, maybe it's a cyborg in the photo? That only introduces more questions.) They aren't answered in the program overview, which it describes as a "systems-centric program" where students learn "technical skills in the field of systems engineering and systems of systems." (It's a well-known fact among universities that repeating "systems" as much as possible is a sign of intelligence.) To wit, the degree offers focus areas in software systems, plain ol' systems, human systems, cybersecurity, and modeling and simulation. Offered through Johns Hopkins' Whiting School of Engineering, the degree awards an MS or MSE, the latter of which requires an undergrad degree from a program accredited by the Engineering Accreditation Commission. That said, there's no difference between the curriculum of the two tracks, which are built on seven or eight core courses and two to three electives. Students have to complete them within five years and must get Bs in their classes to graduate. (Only one C grade will count toward the master's.) Naturally, the required courses all have some version of "system" in their name: Introduction to Systems Engineering, Management of Systems Projects, Software Systems Engineering, System Conceptual Design, System Design and Integration, and System Test and Evaluation. Johns Hopkins is nothing if not consistent. Electives depend on which emphasis students choose from the six available options. All of the core courses are available online, and most of the electives are as well. Among the electives are Management of Complex Systems, Critical Infrastructure, Engineering and Measuring Influence, Statistical Methods and Data Analysis, Communications in Technical Organizations, Software Project Management, and Software Safety. The intent is that students will have a broad skill set after graduation and understand a full range of systems knowledge, such as sufficient technical knowhow to "lead the realization and evaluation of complex systems and systems of systems." Systems! If the program sounds intense, it is—as are the admission requirements. Applicants must have an undergraduate degree in a science or engineering field (with a minimum 3.0 GPA), along with a year of relevant full-time work experience outlined in a "detailed" work résumé. They also need one professional letter of recommendation and transcripts from all college coursework. But hey, there's no GRE requirement. Tuition is about average for the top 10 programs in our list: $27,868. #4. Stevens Institute of Technology Master of Engineering in Systems Engineering Stevens Institute of Technology in Hoboken, NJ, should be a pilgrimage destination for engineers everywhere. The university is the brainchild of inventor/entrepreneur Edwin A. Stevens, who engineered the nation's first steam ferry, and, along with his brother Robert, helped develop the railroad system (and created the first cowcatcher). Another of their brothers, Jon, built the yacht America and founded the America's Cup race. Over the years, SIT alumni created the IMAP email system, bubble wrap, the Gantt chart, and discovered the neutrino. In short, SIT comes correct. In fact, the website for its systems engineering program claims that SIT is "the largest provider of systems engineering education to the U.S. federal government and to industries worldwide." Describing the curriculum as "the right blend of engineering, technology, and management training," SIT says its graduates have the ability to "address systems integration, life cycle issues, and systems thinking at the system and enterprise levels." SIT offers a 30-credit Master of Engineering in systems engineering, with five available concentrations: large-scale cyber-physical systems, embedded cyber-physical systems, space systems, software systems, or unspecified (i.e., general). The 10-course degree breaks down into six required courses, three electives, and a project or thesis. Instead of using electives to fulfill concentration requirements, SIT includes them with the core courses. Half of the six core courses come from the chosen concentration. Regardless of concentration, all courses are grouped into the following areas: modeling, simulation, and analysis (such as Systems Modeling & Simulation or Decision and Risk Analysis); management (Project Management of Complex Systems); concept (Fundamentals of Systems Engineering or Conception of CPS: Deciding What to Build and Why); architecture and design; implementation; and sustainment. Up to six credits must be applied to a project or thesis. If students opt for a thesis, it takes the place of one of their electives. The university suggests students use their electives to earn one of the numerous graduate certificates it offers, which include logistics and supply chain analysis, systems engineering management, urban resilience, integrated ship systems engineering, and a dozen others. SIT's Master of Engineering in systems engineering program has the usual requirements: transcripts, GRE scores, and two letters of recommendation. Prospective students also need to have competency in software programming, per the curriculum requirements. Students lacking professional experience beyond an undergraduate degree will need to take Introduction to Systems Engineering and Fundamentals of Software Engineering to catch up, though some exceptions can be made with the approval of a faculty advisor and the systems engineering program director. The Stevens Institute of Technology is a private school that lies just across the Hudson River from Manhattan, which is a roundabout way of saying it's expensive. How expensive? The most expensive of the programs among the 10 best master's in systems engineering: $39,862. #5. Massachusetts Institute of Technology Master of Science in System Design & Management MIT. Ever heard of it? The university for engineering, technology, and the best and brightest in those fields? No. 3 in National Universities by U.S. News and World Report? No. 1 for graduate Best Engineering Schools? Its industrial/manufacturing/systems engineering programs tie for No. 6, according to U.S. News, with Purdue, Stanford, University of Wisconsin–Madison, and Virginia Tech, but let's be honest. When it comes to engineering, MIT has the name recognition and status that's the envy of most elite universities. The university designs its multidisciplinary systems and design management (SDM) program for early and midcareer professionals who will "learn to use systems thinking to understand the technical, managerial, and societal components of large-scale, complex challenges." Because it's geared toward working people, the university offers three degree options: on campus (finish the program in 16 months), local commuter (21-24 months, one to two courses per semester on campus), and distance (21-24 months, but must spend at least one semester on campus, including an additional semester working on a thesis). In fact, all students are required to spend one high-credit (at least 37 units) 13-week semester as a resident on campus during a spring or fall semester. Most students do it during their second year and spend the other second-year semester researching their thesis back home. No matter the path, all SDM fellows (as the school refers to students in the program) experience some form of distance learning via Foundations of System Design and Management, a three-term course that lasts the entire academic year. The course is conducted synchronously via live, interactive video sessions. Fellows participate from a variety of time zones across the world, which is intentional—MIT wants to replicate "the reality of geographically disparate teams into today's workplace." Foundations of System Design and Management combines in-class discussion, lectures from MIT instructors, guest speakers, individual assignments, and team projects. In fact, the course culminates with an integrated team project that addresses a challenge proposed by a sponsor from industry, government, or somewhere else. The curriculum for the SDM master's breaks down into a minimum 90 subject units and 24 thesis units, including 36 core units, 12 from depth courses, 12 from management foundation courses, and a minimum of 30 electives balanced between engineering and management. The depth and foundation courses aim to train fellows to successfully face complex problems through extra engineering instruction and introductory courses in finance, accounting, and strategy. Students must maintain a cumulative 4.0 GPA (out of 5.0, phew) in coursework to graduate. MIT's elite status makes admission competitive, though the admission requirements are typical: transcripts, three letters of recommendation, GRE/GMAT scores, résumé, and statement of purpose, although the university also requires a personal interview. Applications are accepted in January and March. The good news? MIT is reasonably priced at $18,971, well below the list's average. #6. George Washington University Master of Science in Systems Engineering The list of prominent alumni of George Washington University is long, and it's not even a list. It's lists, plural. The university, located in Washington, D.C., is a factory of leaders in politics, media, government, entertainment, and also national treasures like Tim Gunn, formerly of Project Runway. GW, as it's known, is an important place that graduates Important People, and students earning their Master of Science in systems engineering from the university get to experience that. At a distance. Designed for "working adults with busy lives," the program is completed online via weeknight courses, which are also recorded and available to students afterward. While the curriculum is based on systems thinking, it includes practical business instruction so students have a wide base of knowledge. The curriculum aims to provide students with comprehensive training in "technical skills like axiomatic design and system analysis while also offering in-depth insight into project management and leadership techniques." To wit, the primary topics covered include quality assessment, system and architecture analysis, risk management, engineering large-scale systems, problem-solving with systems engineering tools, and managing technical teams, per the program's website. The course load is simple: 12 classes for a total of 36 credit hours. Among them: the Management of Technical Organizations, Decision Making With Uncertainty, Knowledge Management, Systems Engineering I and II, and Applied Enterprise Systems Engineering. There's also Problems in Engineering Management and Systems Engineering Capstone, in which students work in small groups to apply what they've learned to a real-world problem (proposed by the students and approved by the instructor). The curriculum helps students prepare for the Certified Systems Engineering Professional (CSEP) exam offered by the International Council on Systems Engineering, which further helps employers and others understand that graduates know what they're doing. What kind of stuff will they learn to prove that? Well, they'll apply technical skills like axiomatic design and systems analysis "to observe how systems interact, to design and integrate subsystems, and to assess systems for quality." They'll coordinate organizational functions—like organizational management and behavior, cost and quality control—and supervise technical development. Admission into GW requires a résumé, statement of purpose, transcripts, and three letters of recommendation. GRE or GMAT scores aren't required, but recommended. The admissions site also suggests that "ideal" applicants will have a bachelor's degree—with at least a 2.7 GPA—in engineering, a physical science, mathematics, computer science, business administration, or information technology. They'll also have a C or better in two college calculus courses. If you've completed systems engineering coursework at another university, it won't count at GW, because the school doesn't accept transfer credit. The university does accept money, and a lot of it. As a private university with a reputation for producing Important People, GW lies on the pricey side. While it's not the most expensive program in our top 10, it's still $39,600. Importance doesn't come cheap. #7. University of Southern California Master of Science in Systems Architecting and Engineering The University of Southern California has long been one of the nation's top universities—U.S. News and World Report ranks it No. 22 in National Universities—and it stands to reason it offers an excellent engineering program. Its Viterbi School of Engineering is ranked No. 10 among Best Engineering Schools for graduate study, according to U.S. News. Yes, USC has endured some…unpleasantness in recent years, but it only distracts from the fundamental essence of a university that remains one of the best in the land. And, well, one of the more expensive schools—its MS in systems architecting and engineering costs $36,161. Designed for professionals who have several years of work experience, the program emphasizes "the creative process by which these systems are conceived, planned, designed, built, tested, certified, used, and retired." The interdisciplinary program offers a dozen specializations: aerospace and mechanical systems, artificial intelligence/neural networks, automation and control systems, communication and signal processing systems, computer and information systems, construction, engineering management systems, integrated media systems, manufacturing systems, network-centric systems, software process architecture, and, simply, systems. The MS in systems architecting and engineering requires a minimum of 30 units of coursework, with a cumulative minimum 3.0 GPA: 15 units of required courses, a technical management elective for three credits, a general technical area elective for three, and nine of technical specialization electives. Required courses include stuff like Engineering Economy, Economic Consideration for Systems Engineering, Systems Engineering Theory and Practice, Model-Based Systems Architecting and Engineering, and Systems Architecting, among others. Students have eight choices for a technical management elective, such as Decision Analysis, Modern Enterprise Systems, and Strategies in High-Tech Businesses. The general technical elective has seven choices, like several about software (such as Software Management and Economics), along with stuff like Lean Operations and Case Studies in Systems Engineering and Management. Specialization coursework accounts for another nine units, and students have a variety of options for each one, though all nine should come from a single specialization. Each one has at least four course options, and some have many more. The Computer and Information Systems specialization has eight, for example, and Integrated Media systems nine. The specialization with the shortest name, Systems, has the most, racking up a staggering 15 possible course options, from an Electrical Engineering Research Seminar to Quality Management for Engineers, Network Flows, Decision Analysis, Management of Engineering Teams, and many more. Entrance into USC's MS in system architecting and engineering requires an undergrad degree in engineering, math, or hard science, with a "satisfactory" GPA and similarly "satisfactory" GRE scores, though what qualifies as satisfactory isn't explained. It's USC's favorite word, because the university also requires satisfactory performance in previous coursework related to the major. Industry experience is recommended, but not required. Prospective students also need to supply transcripts, GRE scores, résumé, a personal statement, and three letters of recommendation. #8. University of Pennsylvania Master of Science in Engineering in Systems Engineering The second university in our top 10 stewarded by a Founding Father, the University of Pennsylvania—"Penn" to its friends—dates back to 1740, but it truly came to life under the aegis of Benjamin Franklin. The inventor, writer, and bon vivant ran the school that preceded Penn for many years. His influence looms large over the university more than 250 years later, and not just because the campus in Philadelphia features a statue of him sitting on a bench. University leaders will tell you his spirit of inquisitiveness and invention inspires their academic pursuits now. That's true of the Electrical and Systems Engineering Department, which is part of the School of Engineering and Applied Science and awards the MSE in systems engineering degree. It originated with the merger of the electrical engineering and systems engineering departments in 2002, which occurred to reflect the rapidly changing world of engineering. Most pertinent to this degree, the department decided to change its teaching approach, de-emphasizing specific facts and mastery of tools to produce "broadly educated, curious problem solvers who have a strong grasp of disciplinary foundations and a high level of comfort in self-directed acquisition of new technique," according to its mission statement. Does that sound like you? The MSE in SE program follows that directive by giving students a wide understanding of data science, systems modeling, and optimization and decision-making, according to its website. The approach is grounded at the intersection of electrical and systems engineering, and it aims to provide the "in-depth theoretical foundation and interdisciplinary skills" that today's increasingly complex systems require. But the curriculum is flexible enough to be tailored to the interests and career aspirations of students. The plan of study is simple: 10 course units. They break down into at least one course each from data science, systems modeling, and system design and optimization. Then there's a leadership elective, a technical elective, and two courses from an application area (or a thesis, which is optional, but recommended for students who intend to earn a doctorate). Each section offers a variety of courses. Data science offers six, such as Applied Machine Learning and Data Mining: Learning from Massive Datasets. Systems modeling also has six, from Linear Systems Theory to Systems Methodology. Systems design and optimization has five, including Feedback Control Design and Analysis, Modern Convex Optimization, and Human Systems Engineering. That last one sounds like it could get into the realm of science fiction, but the course description sounds less fantastical: "an introduction to human systems engineering, examining the various human factors that influence the spectrum of human performance and human systems integration." Nary a mention of cyborgs. Penn says it takes full-time students one to two years to finish the degree, depending on course load. To begin the whole process, submit transcripts, a résumé, two-page personal statement in "a readable font/size," two letters of recommendation, and GRE results. The program accepts applications once a year, usually in February. Expect to pay $26,266, which is basically a bull's-eye for the average cost of the 10 best master's in systems engineering. #9. Cornell University Master of Engineering in Systems Engineering Cornell University lives in two worlds. On the one hand, it's a privately endowed Ivy League research university. On the other hand, it's a federal land-grant school and partner of the State University of New York, which means it must "make contributions in all fields of knowledge in a manner that prioritizes public engagement to help improve the quality of life in our state, the nation, the world." Public but elite, Ivy League yet SUNY adjacent. That's not a common combination, but you can't argue with what works. U.S. News and World Report ranks Cornell No. 17 for National Universities and No. 14 for graduate Best Engineering Schools. The university's Master of Engineering in systems engineering is offered both on campus in Ithaca, NY, and online. Interdisciplinary by design, the program requires a minimum of 30 credit hours, including 12 to 14 from electives that students can tailor to suit their interests. Everyone takes 17-19 hours of required courses, which come from three classes—Model Based Systems Engineering, Systems Analysis Behavior and Optimization, and Project Management—and a systems engineering project that counts for six to eight credits. Students draw from a lengthy list of approved electives, which the university divides into groups and with some rules. Students have to take at least one course from the modeling-and-analysis group. (Perhaps Deterministic and Stochastic Modeling in Biological Systems?) Ditto the application group. (May we suggest Stochastic Hydrology?) But they can't take more than one from management (like Managing New Business Development), and no more than one seminar elective, such as Enterprise Engineering Colloquium, is allowed each semester (so two in total). A faculty advisor must approve the entire plan of study, from required courses to electives. And here's an odd note: "You must receive a letter grade for all courses applied toward your degree." So, no dice if you're hoping to use emojis for grades instead of the alphabet. The requirements for the distance-learning program are the same, though course availability varies. The online ME is designed for part-time students, where the on-campus program appears to be meant to be completed in one year of full-time study. Online students have the option to watch lectures live or as a recorded video later. Admission requirements are the same for both as well. The university prefers applicants to have an undergraduate degree in engineering, mathematics, or science, with at least coursework in differential calculus, integral calculus, linear algebra, and differential equations. Oh, and also at least one undergrad course in probability and statistics (though that can be satisfied after admission if need be). Beyond that, the requirements are typical: a one- to two-page statement of purpose, transcripts, two letters of recommendation, and GRE scores. Considering Cornell is an Ivy League school, it doesn't have Ivy League prices: $28,890, just a little more than average for our top 10. #10. University of Michigan–Ann Arbor Master of Engineering in Systems Engineering & Design One of the nation's best-known public universities located in one of the best college towns anywhere, the University of Michigan in Ann Arbor has always enjoyed a certain renown. U.S. News and World Report ranks it No. 25 in National Universities, and for graduate education, it earns No. 4 for Best Engineering Schools and No. 2 for best industrial/manufacturing/systems engineering programs (tied with Columbia University). That is to say it has a pedigree, and the Integrative Systems & Design department of the College of Engineering has serious standards. "Dedicated to educating leaders who can think transformatively and create lasting value in the workplace and society," it has "a rigorous focus on innovation, agility, and purpose in service of the common good." So don't come strolling into Ann Arbor with intending to coast to a master's degree. Because the field "touches everything," as the program website notes, it "has never been more important or more challenging." So the curriculum at Michigan emphasizes human-centered engineering, lean systems engineering, and risk management. That comes to life in a 30-credit program divided into core courses (classified by the school as "breadth"), electives ("depth"), and a capstone. The three core classes lay the foundation (Introduction to Systems Engineering) and try to set some kind of record for multisyllabic names. (Development and Verification of System Design Requirements is one. The other: System Architecting, Concept Development, and Embodiment Design.) Among the 15 elective credits, at least three must come from engineering (say, Design for Six Sigma) and three from design-focused (Advanced Design for Manufacturability, perhaps?). The university offers other electives in automotive engineering, manufacturing, energy systems engineering, and aerospace systems. It all leads to a capstone wherein students work with a company—as an individual or group—to work on an industry problem or open-ended engineering challenge. The work lasts three to six months (i.e., one or two semesters), depending on the scope of the project. The assignments are not random; students get assigned projects based on their background, strengths, and interests, and the university expects the companies to pay them for their time. Some examples of projects in the past include reducing airframe-generated noise in jets, designing the hospital ICU bed of the future, integrating human factors in the design of an electric motorcycle, and more. The idea is that students get real-world experience and companies benefit from students' insights (and cheap labor). Win-win! Admission to the University of Michigan requires a bachelor's degree in engineering or physical sciences ("with good grade-point average," says the admissions page), a one-page academic statement of purpose (how the program will help you attain your educational and career goals), a one-page personal statement (how your background and life experiences motivated you to pursue a degree), and transcripts. The GRE isn't required, but encouraged. Applications are accepted four times throughout the year, corresponding with the upcoming academic term. For tuition, expect to spend $16,856, which puts Michigan on the cheaper end of the 10 best master's in systems engineering. OTHER NOTABLE PROGRAMS #11. Boston University Location: Boston Degree: Master of Science in Systems Engineering Net Price: $29,154 Website #12. Washington University in St. Louis Location: University City, MO Degree: Master of Science in Systems Science & Mathematics Net Price: $27,931 Website IF YOU ENJOYED THAT THEN CHECK OUT OUR ARTICLES ON THE 50 BEST ONLINE MASTER OF MECHANICAL ENGINEERING DEGREE PROGRAMS 2019 & THE 50 BEST ONLINE MASTER OF CIVIL ENGINEERING DEGREE PROGRAMS 2019!

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