***Narrative description of how the institution determined the need for the program. For example, describe what need this program will address and how the institution became aware of that need. If the program is replacing a current program(s), identify the current program(s) that is being replaced by the new program(s) and provide details describing the benefits of the new program(s). If the program will be offered in connection with, or in response to, an initiative by a governmental entity, provide details of that initiative.***

Science, Technology and Society (STS) is a social scientific and humanistic field of study in which the primary research objects are science and technology; the processes and paradigms through which science and technology evolve; and how the results relate to society, culture and politics. Research questions typical to the field include: What is the role of users in the development of new technology? How do relevant actors and audiences adopt new technologies and scientific paradigms? Can technology discriminate, and if so, how do we "govern" its consequences? How are expertise and authority established and contested? How do we balance technological progress versus technological risk?

The program was initiated by a group of faculty with decades of teaching and research experience in sociology, politics and public policy, geography, philosophy, and history related to science and technology. They perceived a growing need, as well as the considerable strengths of Illinois Tech for delivering a program that would both serve the intellectual and career aspirations of our students and attract a new cohort of social science-oriented students to Illinois Tech. At the time these discussions began, faculty and courses were already in place that could be the foundation for an undergraduate STS major. Subsequent hires in Social Sciences and Humanities have enhanced that capacity. Therefore, the program can be delivered without additional faculty resources, using mostly existing courses, without compromising on content or quality.

STS programs have existed, in various forms, in colleges and universities in the US and UK since the mid-1970s. They range from undergraduate minors, to second majors, to stand-alone majors, to master's and doctoral degree programs. Data on the actual number of undergraduate bachelor's degree programs varies considerably, depending on the source. Cal Poly Pomona identifies 35 colleges and universities in the United States with STS programs.[1] Using a somewhat broader definition, the College Board lists 71. These programs are structured and delivered differently by the wide variety of small colleges, large universities, and STEM oriented institutions that offer them.[2] Regardless, STS is increasingly recognized as an important platform for education, research and career development.

Nationally, the following schools offer a standalone undergraduate major in Science and Technology Studies: Cornell, Georgia Tech, Arizona State, Lehigh, Worcester Polytechnic, Brown, University of Washington-Bothell, Bard, RPI, Vassar, University of Texas-Austin, Pomona College, University of Puget Sound, University of Pennsylvania, NYU Polytechnic, North Carolina State, Stanford, New Jersey Institute of Technology, SUNY Morrisville, Harvard, Colby, Cal Poly-Pomona, and the University of California-Davis. Several more feature a major with a narrower scope, such as majors at Princeton and Worchester Polytechnic which each combine STS with policy studies; and several schools with majors focused on the history of

[1] Cal Poly Pomona. n.d. "About STS." Available at https://www.cpp.edu/~class/science-technology-society/about/index.shtml. Last accessed 20 June 2018.
[2] See, https://bigfuture.collegeboard.org/college-search?major=970_Science,%20Technology,%20and%20Society.

science and technology (University of Oklahoma and Johns Hopkins), with one school (Yale) focusing jointly on the history of medicine and public health.

While this proposed program bears similarities to established standalone STS majors in other tech schools, it also leverages distinctive resources of Illinois Tech. It would be unique in Illinois, where there is currently no standalone undergraduate STS degree program. The closest local equivalent is Northwestern University's 10-course "adjunct major" or a minor with core requirements, which draws exclusively from the social sciences and humanities and lacks significant STEM requirements.

Many of the undergraduate programs listed below are liberal arts type programs, while our program emphasizes methodology, professional training and transferable skills in a STEM-oriented undergraduate degree program. And while our program would be locally unique, it draws from best practices of prominent and well-established national examples including similar specializations. Therefore, with this program, Illinois Tech will be able to attract local students who would otherwise have to leave the area to for a comparable degree.

***Selected existing programs***

| **Institution** | **Undergrad programs and requirements** |
|---|---|
| Stanford U. | 60 credit BA or BS; STS Intro and capstone; 2 STEM courses beyond core required; choice of 4 social science and/or humanities-themed concentrations, with course options spanning all university colleges. 5th most popular major for class of 2017.[3] |
| MIT | Second major only; 48 credits, of which 30 are courses with an STS designation, including a pre-thesis tutorial; students opt into "thesis clusters" such as Science in History; Technology, Media & Human Experience; Social Implications of Engineering; Ethics & Policy in Global Age |
| New Jersey Institute of Technology | 36 credit major, including 4 core STS courses, 4 "specialization" courses (spanning human sciences and STEM) plus two electives and a capstone. |
| U of Michigan | Minor only; 3 focus tracks |
| U of Washington Bothell | 60 credit major; 2 required intro level science courses as long as they are designed for majors in respective field. |
| Pomona College | 4 course STEM req. (at least 1 math); 3 concentration courses chosen with advisor; STS/Public Policy Analysis major available |
| Lehigh U | 2 STS core courses, 2 history and/or philosophy, plus 15 credit concentration selected from other disciplines with advice of program director |
| Rensselaer Poly. Inst. | 40 credit major, including 9 courses with STS designation. two methods courses; service internship and senior project required. Four courses in a "technical option" may include courses in Architecture, Management, Humanities, or a STEM field. |

[3] http://facts.stanford.edu/academics/undergraduate-facts

| | |
|---|---|
| University of Pennsylvania | 42 Credit major. Students choose concentration, including Biotech and Biomedicine; Energy & Environment, Global Science and Tech, Information and Organizations; Cultures of Technoscience |
| UC-Davis | 60 credits consisting of 8 "preparatory" courses, including 2 in STS; two sets of "depth subjects" each consisting of 3 upper-division science courses organized under a theme, plus two "modules", which are 3-course clusters with themes like "Cultural Studies of Science & Tech" and "Medicine, Society, Culture". |
| Arizona State | 36 credits, including 6 courses with an STS designation; 6 courses in one of three thematic tracks, where each track consists of STS, social science and STEM courses. Internship and STS methods required. |
| Cal Poly Pomona | 60 credits; 8 STS courses; a major or minor in GIS, Geography or a STEM field required. |

The relevance to STEM is recognized by the National Science Foundation (NSF), which has described STS training and education as central to solutions-oriented research in sustainability, and resilience and adaptation in the face of rapid global environmental change and the introduction of innovative technologies. A workshop organized by the NSF in 2008, "Science, Technology and Sustainability: Building a Research Agenda," emphasized the critically important role STS studies will play in advancing knowledge, research and practice in sustainability. Areas of particular importance that were identified are: 1) Socio-technical systems, including "work in the fields of STS research [focusing] on the coupled systems that link human and social values, behavior, relationships, and institutions to science and technology (p. 3)." 2) Knowledge, ideas and values, involving "inquiries into the human and social practices and arrangements and conceptual and ethical frameworks that provide foundations for particular ways of knowing and valuing aspects of society and the environment that are critical to sustainability problems and solutions (p. 3)." 3) Science, technology and governance, with a "focus on strategies and institutions for governing science and technology in society (p. 3)." And while the report focused on support for research and graduate studies, it also noted the importance of earlier training at the high school and undergraduate levels for building capacity and diversity in STS research and practice (pp. 18-19).[4]

The NSF Science, Technology and Society program (under the Division of Social and Economic Sciences) reflects the orientation of several of the undergraduate STS programs examined in establishing the need for this program.

> The Science, Technology, and Society (STS) program supports research that uses historical, philosophical, and social scientific methods to investigate the intellectual, material, and social facets of the scientific, technological, engineering and mathematical (STEM) disciplines. It encompasses a broad spectrum of STS topics including

[4] Miller, C., D. Sarewitz, A. Light. 2008. Science, Technology, and Sustainability: Building a Research Agenda. National Science Foundation Supported Workshop, 8-9 September 2008. Available at https://www.nsf.gov/sbe/ses/sts/Science_Technology_and_Sustainability_Workshop_Rpt.pdf. Last accessed 5 June 2018.

> interdisciplinary studies of ethics, equity, governance, and policy issues that are closely related to STEM disciplines, including medical science.[5]

This is backed up by STS programs at other universities. For example, the Stanford University STS program webpage lists no fewer than 11 scholarly journals that are either solely devoted to STS or contain substantial STS content.[6]

Therefore, it is in the interest of Illinois Tech students to learn not only how economic, cultural, political, and social forces affect scientific endeavors and technological innovation but how, in turn, science and technology shape society, cultural values, power relations, and the distribution of resources. In the degree proposed here, a suite of core major requirements exposes students to a wide range of thinking on those vital issues; then students specialize in an area from which such knowledge is derived and to which it may be applied; and their specialization is coupled with a STEM minor or equivalent STEM content to familiarize them with an applicable technical or scientific field. In that way, students will enter the workforce and/or post-baccalaureate study with the tools to analyze the social, economic and political impacts of science and technology and the skills needed to communicate and collaborate with scientists and engineers in a wide range of professional settings, including government agencies, community-based organizations, think tanks, news and media organizations, international institutions, non-governmental organizations, and innovative businesses. Students who achieve high levels of academic success in completing the STS bachelor's degree will be able to pursue graduate studies in related fields, such as business administration, law, and public policy, STS and related masters and doctoral programs.

Data from STS programs at other colleges and universities indicate that graduates—with the appropriate additional training and experience—have also gone on to careers in medicine, engineering, product development, management, media production, engineering, and entrepreneurship. Students majoring in STS will receive career advising informed by the issues that motivate them to effect change for the betterment of society through work and/or research in their chosen fields.

The range of potential career options is broad due to the inherently inter-disciplinary nature of the STS program. In addition to introducing students to a broad assessment of the bi-directional influence of science and technology on society from both contemporary and historical perspectives, an STS education emphasizes important general skills:

- Critical thinking and analytical problem solving;
- Quantitative, qualitative, and other research skills;
- Communication and presentation skills including writing;
- Cross cultural and cross-disciplinary understanding; and
- The ability to contribute to multicultural and multi-disciplinary teams.

Courses in the STS degree core draw from the offerings in the Social Sciences and Humanities

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[5]Science, Technology, and Society (STS), National Science Foundations. Available at https://nsf.gov/funding/pgm_summ.jsp?pims_id=5324. Last accessed 8 June 2018.

[6] See, Stanford, The Program in Science, Technology and Society: What is STS? Available at https://sts.stanford.edu/about/what-sts. Last accessed 21 September 2018.

departments and highlight existing strengths across the Lewis College of Human Sciences. Overall, the degree strikes a balance between focus and flexibility. It is built around a core that emphasizes social science research methods and theory, as well as humanistic study of science and technology. Within the major students will chose one of two areas of concentration, a specialization in Science, Technology and Environmental Policy; or Information, Communication and Society. Free electives allow students to enhance and focus their training and broaden their perspective. In addition, in order to provide a solid foundation in a scientific, technical or related field, the program requires a minimum of 15 STEM related credits beyond the core, in the form of a minor or STEM-related coursework, from the College of Science, the College of Engineering, Industrial Technology & Management, Information Security, or Architecture. Advisors will work with students to assure that all three elements of the major (core courses, specialization, and STEM coursework) complement each other and are relevant to the career goals, interests and aptitudes of each student. The STEM content is also structured to be attractive to external transfer students and current IIT students who may be looking for a dual degree or a change of major, including internal transfers. The optional for-credit, unpaid internship will students to apply what they are learning, sample possible career paths, and build their resumes and professional networks.

***Narrative description of how the program was designed to meet local market needs, or for an online program, regional or national market needs. For example, indicate if Bureau of Labor Statistics data or State labor data systems information was used, and/or if State, regional, or local workforce agencies were consulted. Include how the course content, program length, academic level, admission requirements, and prerequisites were decided; including information received from potential employers about course content; and information regarding the target students and employers.***

Typically, it is difficult to link majors in the social sciences and humanities directly to specific careers; furthermore, databases that report on employment by undergraduate major do not list STS specifically. Nevertheless, sources such as O*NET and the Bureau of Labor Statistics, as well as several potential employers, emphasize general skill sets and areas of knowledge that have driven the choice of courses and degree requirements in the proposed STS degree. This involves promoting professional development by pairing the "soft skills" of social sciences and humanities education such as understanding complex institutional environments and analysis of social or political systems, with "hard skills" in both the social sciences and STEM fields, providing a distinct advantage over BA degree STS programs that lack STEM content. In academia and industry there is a growing recognition that the so-called "soft skills"[7] [8] associated with a blend of social sciences, humanities and science education are essential to the efficiency and effectiveness of STEM training and businesses.[9]

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[7] The Future of Jobs Report, World Economic Forum Annual Meeting 2016, Davos-Klosters, Switzerland 20-23 January 2016.

[8] What Graduates Need to Succeed – Colleges and Employers Weigh In. *Chronicle of Higher Education*, May 2017.

[9] See, for example, Sue Marquette Poremba, 2017, Soft skills every tech worker needs, IT Business Edge. Available from https://www.itbusinessedge.com/articles/soft-skills-every-tech-worker-needs.html,; Dawn Kwamoto, 2016, Why technical skills get you in the door, but soft skills advance your career, available from https://insight.ieeeusa.org/articles/why-technical-skills-get-you-in-the-door-but-soft-skills-advance-your-career-2/; Ruy Araujo Costa, 2015, Soft skills for science and technology students: a pedagogical experience, Proceeding of the 2015 Conference on Interactive Collaborative Learning, DOI 10.1109/ICL.2015.7318206, available from https://ieeexplore.ieee.org/document/7318206/; David J. Deming, 2018, The value of soft skills in the labor market,

Job market data indicate the benefits of the kind of hybrid of traditional liberal arts education and grounding in STEM fields and research methods that this degree will offer. Recent studies indicate that due to rapid changes in the technologies developed and applied in business and industry, employers now seek new employees that come to them with already well-developed capacity to work with others in dynamic settings and embrace complexity and change. A forthcoming Michigan State University report indicates excellent prospects for new college graduates in the region across a wide range of fields and industries but also contains the following caveats.

- Employers lament the lack of "soft skills" among college graduates, especially the ability to work with diverse personalities and across different functional areas.
- Internships are important since employers prefer to hire those with professional experience.[10]

This substantiates observations by several scholars and practitioners that, as much or more than technical competence, future employers look for communication and problem-solving skills, and the ability to think creatively. In other words, the current emphasis is on cognitive and social rather than technical qualifications. There is wide agreement about this across industrial fields. Moreover, students are expected to enter the job market with these capabilities already developed.[11]

The record of established STS undergraduate programs regarding placement of their students in jobs, professions and graduate programs reflect a wide range of opportunities. Those programs identify careers related to science, technology and society across a variety of areas, substantiated by stories of the careers of successful alumni. These include writing and research-heavy careers in science and technology; consulting on policy and management related to emerging technologies; marketing and policy analysis for tech companies and foundations; sales and communications positions at tech and energy companies; policy specialists with federal, state and local government agencies and non-profits; administrative and academic positions at colleges and universities; and entrepreneurship involving a wide range of products and services. In addition, specific professions reported by other institutions for their STS graduates who went on for advanced graduate or professional degrees include: business systems analyst, communication support, economist, editor, financial analyst, marketing research manager, medical doctor, museum curator, non-profit founder, policy advisor, policy consultant, regulatory and compliance officer, and technology analyst.[12] A particularly strong area of job

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NBER Reporter, available at http://www.nber.org/reporter/2017number4/deming.html. All of the above were last accessed September 21, 2018.

[10] Cited in Kim Kozlowski, MSU study: Job outlook bright for college graduates, The Detroit News, October 25, 2018, available from: https://www.detroitnews.com/story/news/local/michigan/2018/10/25/michigan-state-study-job-outlook-bright-college-graduates/1762231002/?elqTrackId=47c2c3eeaaf04cb59259fcd321b23d93&elq=cb4b8aec3f0343b2ad2a3b3873efc1c3&elqaid=21146&elqat=1&elqCampaignId=10052. Last accessed 26, October 2018. Significantly, this report surveyed 3,300 employers from US states and territories with Illinois and Michigan listed among the states with the highest numbers of usable responses.

[11] See, for example, The Future of Jobs Report, World Economic Forum Annual Meeting 2016, Davos-Klosters, Switzerland 20-23 January 2016; and What Graduates Need to Succeed – Colleges and Employers Weigh In. *Chronicle of Higher Education*, May 2017.

[12] Sources: https://sts.stanford.edu/sites/default/files/100_jobs_in_sts_0.pdf, http://www.ucl.ac.uk/sts/prospective/careers/alumni-discuss-jobs-with-a-degree-in-sts,

growth according to the U.S. Bureau of Labor Statistics is Health Care and Social Assistance, projected to add nearly 4 million jobs by 2026, or about one-third of all new jobs.[13] Students with STS degrees from other institutions have also qualified for additional, post-baccalaureate training leading to employment as Biomedical Engineer; Clinical Data Manager; Information Security Analyst; Commercial and Industrial Designers; Video Game Designers; Search Marketing Strategists; Human Factors Engineers and Ergonomists; and Management Analysts.[14]

It should be understood that the data provided by established STS programs at other colleges and universities is limited and mainly anecdotal. Career paths—from completion of bachelor's degree to current position—are not specified. But they may be taken as indications of the possibilities that exist for STS majors—many of which require additional training and experience—but are difficult to anticipate.

The combination of "soft skills" and technical knowledge, from the appropriate specialization (such as Science, Technology and Environmental Policy) and STEM coursework will prepare students for fields that require social scientific knowledge and the ability to understand, analyze and communicate relevant scientific and technical information. Opportunities for an STS graduate with, for example, an Information Security minor include positions concerned with drafting or maintenance of information security policy, as well as technical writing positions in information security.[15] STS degree requirements also align well with the knowledge and skills sought by several employers hiring graduates with bachelor's degrees for work related to the challenges of environmental sustainability; such as Climate Change Analyst. O*NET lists 16 skills associated with the profession. Although 79 percent of people employed in the field have a master's degree, the work emphasizes the skills and areas of knowledge that the STS major can provide, allowing graduates to either compete for entry-level positions or pursue more advanced training.

Several courses in the specialization and STS core provide direct preparation for graduates seeking such positions. These include: PS 329, Environmental Politics and Policy; PS 338, Energy Policy; SSCI 380, International Development; and PS 388, International Law and Organizations. In addition, advisors can authorize substitutions with special topics courses, such as recent offerings in Urbanized Ecosystems, Climate Change Law and Policy, and Environmental Politics and Economic Globalization. A valuable skill set will be provided by the capstone course recommended for this specialization: SSCI 408, Methods of Policy Analysis. Careers such as those described above value research skills and policy impact analysis focused on particular types of industrial, activities, patterns of human settlement, and geography. Courses that provide useful preparation include SSCI 389, Urban Policy Analysis; SSCI 225 and 325, Geographic Information Systems; or selected social science electives, such as SSCI 388, Economic Impact Analysis; and SSCI 389, Urban Planning Analysis.

It is expected that the STS undergraduate degree will also provide suitable preparation for several master's programs in existence or under development at Illinois Tech—with an eye

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http://drexel.edu/coas/academics/graduate-programs/science-technology-society/alumni/, http://www.sts.rpi.edu/pl/bs-sts.

[13] Source: https://www.bls.gov

[14] Source: https://www.onetonline.org/find/bright?b=1&g=Go

[15] NICE work role Cyber Policy and Strategy Planner, OV-SPP-002 as per NIST Special Publication 800-181. Available from https://csrc.nist.gov/publications/detail/sp/800-181/final. Last accessed 12 June 2018.

toward creating new co-terminal degree programs—including: Master of Public Administration, Master of Law (L.L.M.), Master of Business Administration, Master of Science in Environmental Sustainability, Master of Science in Technology and Humanities, and Master of Science in Technical Communication and Information Architecture.

Finally, a number of STS-related fellowships and internship programs exist for students and graduates. One of the best-known fellowship programs in science and technology policy is run by the American Association for the Advancement of Science, including the Tisdale Fellowship in science and technology policy.[16] In addition, many of the organizations listing employment opportunities consistent with STS training also offer internships (especially in the government and not-for-profit sectors).

***Narrative description of any wage analysis the institution may have performed, including any consideration of Bureau of Labor Statistics wage data related to the new program.***

In terms of the relevant job market trends,

> [e]mployment of life, physical, and social science occupations is projected to grow 10 percent from 2016 to 2026, faster than the average for all occupations, which will result in about 124,800 new jobs. Increasing demand for expertise in the sciences, particularly in occupations involved in biomedical research, psychology, energy management, and environmental protection, is projected to result in employment growth.
>
> The median annual wage for life, physical, and social science occupations was $64,510 in May 2017, which was higher than the median wage for all occupations of $37,690.[17]

O*NET provides data for median wages with appropriate undergraduate degrees and skill sets for several of the occupational categories mentioned above. Below is a sample of those requiring skills and knowledge acquirable through the STS major, and for which a bachelor's degree is the most common "educational level required."[18] Note that some of these occupational categories require substantial on-the-job experience and/or post-baccalaureate degrees for advancement; therefore, median wages may also reflect a substantial minority of employees with qualifications beyond a bachelor's degree.

| **Occupation** | **Median annual salary** | **% employed with bachelor's degree** | **Expected 2016-26 growth rate*** |
|---|---|---|---|
| Environmental compliance inspectors | $67,870 | 86% | 5-9% |
| Government property inspectors and investigators | $67,870 | 39% (41% associate degree or certificate) | 5-9% |
| Regulatory affairs specialists | $67,870 | 78% | 5-9% |

[16] For additional details, see https://www.aaas.org/page/stpf/fellowship-resources.
[17] Bureau of Labor Statistics. Occupational Outlook Handbook: Life, Physical and Social Science Occupations. U.S. Department of Labor. Available from: https://www.bls.gov/ooh/life-physical-and-social-science/home.htm. Last accessed 1 June 2018.
[18] Data compiled from O*NET Online, "Find Occupations: career clusters." Available from: https://www.onetonline.org/find/. Last accessed 19 June 2018.

| | | | |
|---|---|---|---|
| Clinical research coordinators | $118,970 | 56% | 10-14% |
| Transportation planners | $79,370 | 75% | 5-9% |
| Broadcast news analysts | $62,910 | 67% | 0% |
| Public relations specialists | $59,300 | 92% | 5-9% |
| Technical writers | $70,930 | 33% (51% associate degree or some college) | 10-14% |
| Geographic Information Systems technicians | $88,510 | N/A | 5-9% |

*O*NET considers 5-9% growth to be "average" and 10-14% "above average."

More specifically, and perhaps a clearer indication of entry-level salaries for graduates with BS degrees, the New Jersey Institute of Technology reports an average starting salary for its class of 2016 STS majors of $50,775.[19]

**Specializations and careers**

Each STS major will choose a 15 credit-hour specialization within the major; and either a catalog-listed STEM minor or 15 credits of appropriate STEM coursework. The option of appropriate STEM coursework can be satisfied by an appropriately structured set of 15 credits of STEM courses outside the core curriculum, after consultation with the STS adviser and approval by the faculty/ adviser(s) in the relevant STEM field(s). Students will be advised on the selection of specialization and minor—along with course selection within the major core and elective requirements—based on their career goals and interests. With the appropriate specialization, STS majors will be prepared for fields that require social scientific knowledge and the ability to understand, analyze and communicate relevant scientific and technical information.

The following table includes sets of careers associated with specific combinations of specializations within the STS major, required STEM content and, where appropriate, post-baccalaureate training. Then, representation samples with specified career paths, based current or recent job announcements are presented for each of the proposed specializations.

***i. Specialization in Science, Technology and Environmental Policy***

The specialization emphasizes political dynamics and policy challenges at multiple levels of governance—local, national, regional, and global—and the societal impacts of change in such areas as technological innovation, as well as various aspects of human security, and sustainability of the natural environment. This specialization emphasizes policy analytical tools, and the curriculum is designed to provide students with repeated opportunities to conduct policy analysis.

The specialization examines the aforementioned issue-areas as connected sets of economic and social challenges with the goal of helping students understand and contribute to societal responses. With the communication and research skills gained through the STS core requirements and IIT Core Curriculum, graduates are prepared for entry level positions in a variety of government agencies, environmental NGOs, businesses and professional organizations, and prepared for post-baccalaureate studies in STS, Environmental Studies, Public

[19] Science, Technology, and Society, New Jersey Institute of Technology, available from: https://www.njit.edu/academics/major/science-technology-and-society. Last accessed 24 October 2108.

Policy, and related fields.

Many of the minors relevant for students specializing in Science, Technology, and Environmental Policy will complement a student's training in policy analysis, particularly areas targeting innovation processes at local and national levels, and environmental policy as implemented by local and national governments, and international organizations. For example:

- Students minoring in Artificial Intelligence will be able to conduct analyses on policies related to surveillance, smart policing, and the Internet of Things.
- Students seeking positions related to urban sustainability and/or environmental impacts of the built environment could minor in Architecture or Construction Management.
- Students minoring in Information Security will be able to conduct analyses on cyberattacks, malware, and the international political economy of a revamped Cold War that centers on the embedding of security risks within countries' high technology exports.
- Students interested in biodiversity conservation or the effects of environmental stressors on health and wellness may choose to minor in Biology or Food Science and Nutrition.[20]
- Students minoring in Applied Math or Statistics could work in data analytics in research institutes, NGOs, financial services and management consulting; this path also strengthens applications for graduate study in Public Policy Analysis.

Career opportunities exist in both the private and public sectors. A recent posting by Northwestern Medical for an Innovation Analyst requires a bachelor's or master's degree and: skills in data extraction, report generation, and information visualization.[21] Chicago-based Peak 6 recently posted a call for an entry-level Information Security Specialist who can conduct program audits and assessments, identify security threats and evaluate "vendor due diligence questionnaires." The firm also offers internships and emphasizes that this entry level position includes a strong focus on-the-job training.[22] Environmental NGOs and advocacy groups offer entry level opportunities for interested generalists, but many require research assistants, representatives, and associates who can make substantive policy-relevant contributions to specific campaigns and issue areas. A recent listing for Urban Conservation Associate in Michigan requires a bachelor's degree in an unspecified field, a skill set consistent with a liberal arts education, and "coursework or other training in biology, ecology, natural resources management or related field."[23]

For those students with interests beyond the local or national regions, opportunities with international organizations, such as specialized agencies of the United Nations, international financial institutions, and regional development banks are more difficult to assess. However, employment in such organizations is often initiated through the missions of the applicants' home country, thereby providing potential opportunities for international students majoring in STS.

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[20] Several other minors would be appropriate choices but the prerequisites for required courses may make them inaccessible for many STS majors.
[21] Available from: https://nmhc.referrals.selectminds.com/jobs/innovation-analyst-innovation-full-time-days-21674. Last accessed November 3, 2018.
[22] Available from: https://www.peak6.com/open-positions/?gh_jid=1279751. Last accessed November 3, 2018.
[23] Available from https://www.nature.org/en-us/connect/careers/. Last accessed September 7, 2018.

Organizations such as the UN Environment Programme offer international internships for students in the undergraduate fourth year or within one year of graduation who intend to go on for graduate work.[24]

***ii. Specialization in Information, Communication and Society***

The digital age has added new layers of complexity to the procedures, institutions and technologies through which knowledge is acquired and disseminated. The public is increasingly concerned about the integrity of these processes and the businesses and government agencies that often run them. These include the "datafication" of individuals; the increasingly disputable nature of news in our discourse, and new ideas and products in the marketplace.

The specialization in Information, Communication and Society (ICS) prepares students to confront these trends in their careers and take positions within them as effective, socially-conscious, and ethical actors. Many roles require technological and social scientific literacy and strong communication and analytic skills. For example, students interested in public relations or marketing might choose to minor in Artificial Intelligence, take the COM 383 Social Networks course, pursue an internship in technology and management consulting,[25] and seek a career in digital marketing and design.[26] A student interested in pursuing a career in user experience can take SOC 386 Qualitative Research Methods and COM 384 Humanizing Technology while pursuing a minor in Architecture to study the links between social actors and designed environments, objects and interfaces. This can prepare students for a graduate level degree in design, or direct entry into the workplace as a design analyst in retailing and subsequent career tracks in user experience, digital marketing and design. This line of study also prepares students for careers in technology consulting, particular for in-house corporate communications.

Information technology is increasingly at the center of intellectual property and regulatory compliance controversies. Students interested in careers in technology-related law can, for example, apply for an (undergraduate) legal internship in intellectual property at a major consumer technology company, or to help research the relationship between new federal guidelines and product offerings at an international foods company.

In addition to postgraduate options in Design and Law, graduates from this track will be prepared to apply for professional degrees oriented towards the organization, administration, effective use, interpretation, and communication of information. These include master's degrees in Library Science (MLS), Business Administration (MBA), and Education (M.Ed.). Many schools nationally now offer master's degrees in Information Science or Information Systems (e.g., Pratt, Michigan, U. Arizona, Texas-Austin), and many offer degrees with a more specific focus, such as Kent State's Master's in Knowledge Management, UNC-Chapel Hill's degree in Digital Curation, Berkeley's degree in Information and Cybersecurity, and U. Kentucky's degree in Information, Communication Technology. Many of these schools also offer a Ph.D. program appropriate for ICS- track STS majors. Other PhD options would include STS, Sociology, and Communications

[24] See, https://www.unenvironment.org/work-with-us. Last accessed September 19, 2018.
[25] All internships refer to actual listings in the Chicago area from indeed.com, current to October 23, 2018.
[26] All jobs refer to actual listings in the Chicago area from Idealist.com, current to October 14, 2018.

***Narrative description of how the program was reviewed or approved by, or developed in conjunction with, one or more of the following: a) business advisory committees; b) program integrity boards; c) public or private oversight or regulatory agencies (not including the state licensing/authorization agency and accrediting agency); and d) businesses that would likely employ graduates of the program. For example, describe the steps taken to develop the program, identify when and with whom discussions were held, provide relevant details of any proposals or correspondence generated, and/or describe any process used to evaluate the program.***

The proposal process has benefited from the advice of experts with extensive experience in STS and related fields. It was developed by a committee of social science and humanities faculty with decades of experience researching and teaching in STS-related areas of sociology, political science and public policy, philosophy, history, and regional science. In addition, one member of the committee has an undergraduate degree in metallurgical engineering, another has a master's degree in chemistry and molecular biology (with minors in mathematics and physics), and a third member has a bachelor's degree in computer science and a master's degree in urban planning. Faculty involved at various stages of the process carefully researched programs at other institutions. Three members regularly participate in professional association meetings and conferences that provide opportunities to network and consult with faculty from other institutions with STS programs including the Society for Social Studies of Science (the international professional organization of STS scholars), the European Association for Science and Technology Studies, the Society for the History of Technology, the Atlanta Conference of Science and Innovation Policy, the Science, Knowledge and Technology Section of the American Sociological Association, and the Triple Helix International Conference.

An earlier version of this proposal was presented to the Undergraduate Studies Committee (UGSC) and received useful recommendations for including adequate science and technology content and greater clarity of purpose. Further review of established STS programs at comparable institutions also reinforced the usefulness of specializations (or areas of concentration) for focusing students' interests. Consultations by committee members with other Illinois Tech departments, colleges, and programs reinforced the UGSC recommendations for adding required STEM content in the form of a minor or course cluster. Those meetings included discussions of appropriate minors, the possible creation of new minors tailored to the needs of STS students, and career preparation. Members also discussed the proposal with the original Academic Director of the Kaplan Institute and faculty from the Institute of Design, indicating that: the program would be good preparation (after appropriate field experience) for graduate study at ID; STS students could make important contributions to the work of the Kaplan Institute as participants in projects and observers and analysts of the institute's work.

**ENROLLMENT ESTIMATES**: YEAR 1 =5 new students, YEAR 2 = 5 new students, YEAR 3 = 5 new students

***Since quality advising is a key component of good retention, graduation, and career placement, how will students be mentored? What student professional organizations will be formed? How will the department work with the Career Services office to develop industry connections?***

Students majoring in STS will be advised by a program director chosen from among the qualified faculty of the Social Sciences Department. Advising on the minor or STEM content

will be provided by the adviser in the minor/STEM field. Other faculty participating in the program will assist with student mentoring, such as internship supervision and career advice in their areas of expertise once students have chosen their specializations. Students may also get the benefit of input from faculty in the departments of their minors.

A curriculum committee will be formed consisting of three or four faculty from Social Sciences and Humanities. The committee will recommend and review curriculum changes and conduct annual program assessments. The department has not as yet consulted extensively with Career Services due to transition in that office; however, it has solicited information on industry connections from other staff at Illinois Tech and used that to inform planning. It is our intention to build a strong relationship with Career Services.

**PROGRAM RESOURCES**

The faculty resources currently available in the Social Sciences and Humanities Departments, and Lewis College are expected be sufficient because all but one course proposed for the degree is listed in the bulletin and most of those are in current faculty rotations. Only one new course will need to be developed and assigned—LCHS 2XX, Introduction to Science, Technology, and Society.

**PROPOSED BULLETIN ENTRY**

The Bachelor of Science in Science, Technology and Society (STS) is an interdisciplinary degree that combines coursework in the Social Sciences, Humanities and selected fields in science and technology. STS students examine the influence of political, economic, cultural, and social forces on science and technology, as well as the impact of science and technology on society, from both contemporary and historical perspectives. The major is notable for the flexibility students have to focus on the aspects and approaches of STS that most interest and motivate them. The major also strikes a balance between breadth and focus, including a mix of core requirements and interdisciplinary electives. Coursework covers areas such as sustainability, the ethical aspects of science and technology, medicine and health, the history and sociology of science, human interaction with technologies and technological systems, the economics of innovation, and science and technology policy. In this way, graduates with a Bachelor of Science in STS will have a unified understanding of the interdependencies among science, technology, and society.

Through providing broad training in methodological and professional skills, the STS major prepares students for both careers and graduate studies. The training includes qualitative and quantitative research methods, Geographic Information Systems, computational analysis as well as intercultural communication skills and a professional experience through academically-supervised internship and a rigorous, research-based academic capstone focusing on policy or program evaluation and analysis.

The objectives of the STS major are to develop in its graduates:

- An understanding of the multi-faceted interactions between society, science and technology;

- Skills needed to analyze these interactions and to formulate policy recommendations;
- The ability to communicate across disciplines and cultures;
- The knowledge and skills to compete in today's international job market.

Students pursuing a Bachelor of Science in Science, Technology and Society (STS) learn not only how economic, cultural, political, and social forces affect scientific endeavors and technological innovation but how, in turn, science and technology shape society, cultural values, power relations, and the distribution of resources. The BS in STS prepares students for careers in government agencies, community outreach, think tanks, science journalism, international institutions, and non-governmental organizations, as well as advanced research in the history of science, humanities, political economy, and sociology. Students who successfully complete the STS degree will be able to pursue graduate studies in related fields, business administration, law, and public policy. Our career advising is based on the issues that motivate students to effect change for the betterment of society.

In addition to introducing students to a broad assessment of the bi-directional influence of science and technology on society from both a contemporary and historical perspective, the STS education emphasizes important general skills:

- Critical thinking and analytical problem solving;
- Quantitative, qualitative, and other research skills;
- Communication and presentation skills;
- Cross cultural and cross-disciplinary understanding; and
- The ability to contribute to multicultural and multi-disciplinary teams.

***Admission requirements***

Requirements will be the same as for all other BS degree programs offered by the Social Sciences Department.

***PROGRAM OUTCOMES AND ASSESSMENT PROCESS***

| Learning goal | Courses/student work used to assess |
|---|---|
| Demonstrates understanding of major concepts and theoretical principles in the field | Selected assignment from LCHS 2XX |
| Demonstrates understanding of scholarly work | Selected assignment from LCHS 2XX |
| Students will be able to describe and explain key components of the societal and cultural impacts of institutions, practices, and developments related to science and technology | Selected assignment from LCHS 2XX |
| Students will demonstrate their ability to define the challenges brought about by science and technology, and determine their impact | Selected assignment from LCHS 2XX |
| Students will demonstrate that they can | Literature review assignment from upper level |

| | |
|---|---|
| critically review theoretical explanations of societal problems and solutions | course in major core |
| Students will demonstrate their ability to justify evidence-based assumptions or recommendations | Research-based assignment from any upper level course taken for major |
| Students will be able to articulate and defend arguments that are clear, logical and substantive | Written assignment from selected upper level course required for major |
| Students will be able to disseminate and explain research results in different formats | Final paper for PS 408 OR SSCI 486 AND presentation on SSCI 493 internship |

***In what semesters will the data be collected to assess this learning goal, and by whom?***
STS undergrad program director will collect data at the end of each spring semester.

***Provide the name of the rubric that will be used to assess the extent to which students are achieving this learning goal.***
An appropriately revised version of the rubrics currently used for the Social and Economic Development Policy major will be used.

***How often and by whom will the data be analyzed? What benchmarks or targets will be used to interpret your results?***
Annually.

***Briefly describe the process that will be used to share the results with faculty and use these to motivate program improvement.***
Assessment will be done by a subcommittee of the STS Curriculum Committee plus an outside member; all will be core faculty in the department. Data and findings will be uploaded to a Google Drive folder accessible by all Social Sciences Department faculty and participating faculty from Humanities. Results and recommendations will be examined by the STS Curriculum Committee. Changes proposed on the basis of the findings will be submitted to the Social Science faculty for approval.

**DISTRIBUTION OF CREDIT HOURS**

| | |
|---|---|
| Science, Technology and Society Major Core | 30 |
| STS specialization | 15 |
| Introduction to the Profession | 2 |
| IIT Core-Science | 10 |
| IIT Core-CS | 2 |
| IIT Core-Math<br>Including PSYC 203, BUS 221, or MATH 225 | 6-7 |
| IIT Core-IPRO | 6 |
| IIT Core-LCHS | 21 |
| Required STEM coursework or minor | 15 |
| Free Electives (some may be displaced by pre-requisites for required courses in the chosen minor) | 15 |
| SSCI 493 unpaid internship or additional upper-level free elective | 3 |
| Capstone | 3 |
| **MIN TOTAL** | **128** |

## SCIENCE, TECHNOLOGY AND SOCIETY MAJOR COURSES

**Core (30 credits)**

LCHS 2XX: Introduction to Science, Technology and Society
PS 332: Politics of Science and Technology
SOC 301: The Social Dimension of Science
SOC 322: Sociology of Objects and Technology
HUM 380: History of Science OR HIST 375: History of Computing
PHIL 360: Ethics
SSCI 209: Social Science Research Methods

*ONE additional theory course from the following*
SOC 302: Science and Belief OR
SOC 303: Science in Society OR
PHIL 351: Science and Method

*TWO additional research methods courses chosen from the following:*
SSCI 225: Introduction to Geographic Information Systems (GIS)
SSCI 325: Intermediate GIS
SOC 305: Social Communication
COM 383: Social Networks
SSCI 385: Computational Social Science
SOC 386: Qualitative Social Science Research Methods
SOC 387: Fieldwork Methods
SSCI 389: Urban Planning Analysis*
COM 435: Intercultural Communication
SSCI 480: Introduction to Survey Methodology

**Specialization (15 credits) – *Choose one area of specialization, and take at least 5 courses, following the requirements for your chosen specialization. Course substitutions or an alternative specialization may be taken with advisor's approval.***

**(i) Science, Technology, and Environmental Policy**

SSCI 378: Innovation Policy
PS 306: Politics and Public Policy OR PS 313: Comparative Public Policy*

And THREE of the following:
PS 306: Politics and Public Policy OR PS 313: Comparative Public Policy*
PS 329: Environmental Politics and Policy
PS 338: Energy Policy
SSCI 204: States, Markets, and Society
SSCI 354: Urban Policy
PS 360: Global Political Economy OR PS 388: International Law and Organizations
SSCI 320: Sociology of Accidents, Disasters and Security
SSCI 318: Global Health
SSCI 359: Humans, Ecology, and Environment
SSCI 380: International Development

Capstone: PS 408: Methods of Policy Analysis

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**(ii) Information, Communication, and Society**

PHIL 370 Engineering Ethics OR PHIL 380* Ethics of Communications Technology

And ONE of the following:
- HIST 355: Digital Labor
- HIST 385: Women in Computing History
- HUM 352: Gender and Technological Change
- SSCI 321 Social Inequality

And THREE of the following:
- COM 323: Communicating Science
- COM 350: Digital Media and Citizenship
- COM 383: Social Networks
- COM 372: Mass Media and Society
- COM 384: Humanizing Technology
- HIST 355: Digital Labor
- HIST 385: Women in Computing History
- HUM 352: Gender and Technological Change
- PHIL 370: Engineering Ethics
- SSCI 321: Social Inequality
- COM 380*: Social Media and Society
- PHIL 380*: Ethics of Communications Technology
- HUM 380*: Philosophy of Decision Making

Capstone: SOC 490 Sociology Capstone; COM 421 Technical Communication; or COM 424 Document Design

| |
|---|
| **Internship or upper-level STS elective (3 credits)** |
| **Capstone (3 credits)** a 400-level capstone determined by area of specialization |

*Courses not chosen as a major requirement may be used as a major elective where appropriate.

**STEM requirement as minor or appropriate coursework:** A minor or the equivalent is required to provide a focused STEM component to the STS major. Minors will be selected in consultation with the program director/advisor based on the student's interests and goals and academic qualifications for successfully completing the required coursework. Typically, students will take a minor linked to their chosen specialization within the major and their career goals and intellectual interests. Students transferring into the STS major from other Illinois Tech majors or other institutions may be approved for substitution of a minimum of 15 credit hours of appropriate STEM coursework (above and beyond Core Curriculum requirements). The required STEM content can be satisfied either by taking an existing minor, or by an appropriately structured set of 15 credits of STEM courses outside the core curriculum, after consultation with the STS adviser and approval by the adviser/faculty in the relevant STEM field(s).
Students who enter Illinois Tech as STS majors may consult with the STS undergraduate program director about similar substitutions as well. All such substitutions must be approved by the program director.

# SAMPLE CURRICULUM /PROGRAM REQUIREMENTS

*Provide below a sample curriculum and the program requirements, as they would appear in the IIT Undergraduate Programs bulletin or Graduate Programs bulletin as appropriate. These are samples with elective choices subject to change, within the framework of requirements of the degree listed above.*

**Course Plan: Science, Technology and Society (generic)**

| | |
|---|---|
| **Semester 1** | |
| LCHS 100 | 2 |
| HUM 2XX | 3 |
| LCHS 2XX: Introduction to Science, Technology and Society | 3 |
| MATH introduction (typically 119, 122, 130, 148, 151 or 180) | 3 |
| CS 105 or 110 | 2 |
| Natural Science or Engineering Elective | 3 |
| | 16 cr |
| **Semester 2** | |
| Social Science 2XX or 3XX | 3 |
| SSCI 209: Research Methods | 3 |
| Natural Science or Engineering Elective | 4 |
| Statistics (PSYCH 203, BUS 221 or MATH 225) | 3-4 |
| Major specialization requirement | 3 |
| | 16-17 cr |
| **Semester 3** | |
| PS 332: Politics of Science & Tech | 3 |
| SSCI 385: Computational Social Science | 3 |
| SOC 301 or 303 or PHIL 351 | 3 |
| Natural Science or Engineering Elective | 3 |
| Minor Requirement | 3 |
| Major specialization elective | 3 |
| | 18 cr |
| **Semester 4** | |
| Methods course | 3 |
| SOC 322: Sociology of Objects and Technology | 3 |
| HUM 380: History of Science OR HIST 375: History of Computing | 3 |
| Minor Requirement | 3 |
| Major specialization elective | 3 |
| | 15 cr |
| **Semester 5** | |
| SOC 302: Science and Belief | 3 |
| PHIL 360: Ethics | 3 |
| Free elective | 3 |
| Humanities 3XX | 3 |
| Minor Requirement | 3 |
| | 15 cr |
| **Semester 6** | |
| | |
| SSCI 493 (internship) or extra free elective | 3 |
| Humanities 3XX | 3 |
| IPRO | 3 |

| | |
|---|---|
| Minor Requirement | 3 |
| Free elective | 3 |
| | 15 cr |
| **Semester 7** | |
| STS **Capstone** | 3 |
| Major specialization elective | 3 |
| IPRO | 3 |
| Social Science 3XX | 3 |
| Minor Requirement | 3 |
| Free elective | 3 |
| | 18 cr |
| **Semester 8** | |
| Major specialization elective | 3 |
| Social Science 3XX | 3 |
| Humanities 3XX or Social Science 3XX | 3 |
| Free elective | 3 |
| Free elective | 3 |
| | 15 cr |
| **Min Total 128-9 credit hours** | |

## Course Plan: Science, Technology and Society with Biology minor

| **Semester 1** | |
|---|---|
| LCHS 100 | 2 |
| HUM 2XX | 3 |
| LCHS 2XX: Introduction to Science, Technology and Society | 3 |
| MATH 122 | 3 |
| CS 105 or 110 | 2 |
| Natural Science or Engineering Elective | 4 |
| | 17 cr |
| **Semester 2** | |
| Social Science 2XX or 3XX | 3 |
| SSCI 209: Research Methods | 3 |
| Natural Science or Engineering Elective: CHEM 125 | 4 |
| Statistics (PSYCH 203, BUS 221 or MATH 225) | 3-4 |
| Major specialization requirement | 3 |
| | 16-17 cr |
| **Semester 3** | |
| Major specialization requirement | 3 |
| SSCI 385: Computational Social Science | 3 |
| SOC 301 or 303 or PHIL 351 | 3 |
| Natural Science or Engineering Elective | 3 |
| Biology Minor Requirement: BIOL 107 | 3 |
| Major specialization requirement | 3 |
| | 18 cr |
| **Semester 4** | |
| Methods course | 3 |
| SOC 322: Sociology of Objects and Technology | 3 |
| HUM 380: History of Science OR HIST 375: History of Computing | 3 |
| Minor Requirement: BIOL 115 | 3 |
| Major specialization requirement | 3 |
| | 15 cr |
| **Semester 5** | |
| SOC 302: Science and Belief | 3 |
| PHIL 360: Ethics | 3 |
| Free elective: CHEM 237 (prerequisite for BIOL 445) | 4 |
| Humanities 3XX | 3 |
| Minor Requirement: BIOL 214 | 3 |
| | 16 cr |
| **Semester 6** | |
| SSCI 493 (internship) or extra free elective | 3 |
| Humanities 3XX | 3 |
| IPRO | 3 |
| Minor Requirement: BIOL 210 | 3 |
| Free elective | 3 |
| | 18 cr |
| **Semester 7** | |
| PS 408: Methods of Policy Analysis | 3 |
| PS 338: Energy Policy | 3 |
| IPRO | 3 |
| Social Science 3XX | 3 |
| Minor Requirement: BIOL 445 | 3 |
| | 15 cr |

| **Semester 8** | |
|---|---|
| Major specialization requirement | 3 |
| Social Science 3XX | 3 |
| Humanities 3XX or Social Science 3XX | 3 |
| Free elective | 3 |
| Free elective | 3 |
| | 15 cr |
| **Min Total 130-1 credit hours** | |
| | |

## Course Plan: Science, Technology and Society with Architecture minor

| **Semester 1** | |
|---|---|
| LCHS 100 | 2 |
| HUM 2XX | 3 |
| LCHS 2XX: Introduction to Science, Technology and Society | 3 |
| MATH 119 or 122 | 3 |
| CS 105 or 110 | 2 |
| Natural Science or Engineering Elective | 3 |
| | 16 cr |
| **Semester 2** | |
| Social Science 2XX or 3XX | 3 |
| SSCI 209: Research Methods | 3 |
| Natural Science or Engineering Elective | 4 |
| Statistics (PSYCH 203, BUS 221 or MATH 225) | 3-4 |
| Major specialization requirement | 3 |
| | 16-17 cr |
| **Semester 3** | |
| PS 332: Politics of Science & Tech | 3 |
| SSCI 385: Computational Social Science | 3 |
| SOC 301 or 303 or PHIL 351 | 3 |
| Natural Science or Engineering Elective | 3 |
| Minor Requirement—ARCH 100 (Introduction) | 3 |
| Minor Requirement—ARCH 107 (Design Communications I) | 3 |
| | 18 cr |
| **Semester 4** | |
| Methods course | 3 |
| SOC 322: Sociology of Objects and Technology | 3 |
| HUM 380: History of Science OR HIST 375: History of Computing | 3 |
| Major specialization elective | 3 |
| Major specialization elective | 3 |
| | 15 cr |
| **Semester 5** | |
| SOC 302: Science and Belief | 3 |
| PHIL 360: Ethics | 3 |
| Minor Requirement (AAH 119) | 3 |
| Humanities 3XX | 3 |
| Minor Requirement (ARCH 113), or free elective for student taking AAH 120 | 3 |
| | 15 cr |
| **Semester 6** | |
| Major specialization elective | 3 |
| SSCI 493 (internship) or extra free elective | 3 |
| Humanities 3XX | 3 |
| IPRO | 3 |
| Minor Requirement AAH 120 (History of World Architecture) or free elective | 3 |
| Free elective | 3 |
| | 18 cr |
| **Semester 7** | |
| STS **Capstone** | 3 |
| Major specialization elective | 3 |
| IPRO | 3 |
| Social Science 3XX | 3 |

| | |
|---|---|
| Minor Requirement (one extra. ARCH 108, ARCH 114, ARCH 413 and AURB 201 avoid prerequisites ARCH 321 would require AAH 119 & 120) | 3 |
| | 15 cr |
| **Semester 8** | |
| Major specialization elective | 3 |
| Social Science 3XX | 3 |
| Humanities 3XX or Social Science 3XX | 3 |
| Free elective | 3 |
| Free elective | 3 |
| | 15 cr |
| **Min Total 128-9 credit hours** | |

**Course Plan: Science, Technology and Society with general STEM requirement (Graphics and CAD for non-Engineers focus as example)**

| **Semester 1** | |
|---|---|
| LCHS 100 | 2 |
| HUM 2XX | 3 |
| LCHS 2XX: Introduction to Science, Technology and Society | 3 |
| MATH 122 | 3 |
| CS 105 or 110 | 2 |
| Natural Science or Engineering Elective | 3 |
| | 16 cr |
| **Semester 2** | |
| Social Science 2XX or 3XX | 3 |
| SSCI 209: Research Methods | 3 |
| Natural Science or Engineering Elective | 4 |
| Statistics (PSYCH 203, BUS 221 or MATH 225) | 3-4 |
| Major specialization requirement | 3 |
| | 16-17 cr |
| **Semester 3** | |
| PS 332: Politics of Science & Tech | 3 |
| SSCI 385: Computational Social Science | 3 |
| SOC 301 or 303 or PHIL 351 | 3 |
| Natural Science or Engineering Elective | 3 |
| Minor Requirement—EG 225 (Engineering Graphics for non-engineers) | 3 |
| Major specialization elective | 3 |
| | 18 cr |
| **Semester 4** | |
| Methods course | 3 |
| SOC 322: Sociology of Objects and Technology | 3 |
| HUM 380: History of Science OR HIST 375: History of Computing | 3 |
| Minor Requirement—EG 325 (Advanced Engineering Graphics non-engineers) | 3 |
| Major specialization elective | 3 |
| | 15 cr |
| **Semester 5** | |
| SOC 302: Science and Belief | 3 |
| PHIL 360: Ethics | 3 |
| Free elective | 3 |
| Humanities 3XX | 3 |
| Minor Requirement—EG 329 (Graphic Representation for non-engineers) | 3 |
| | 15 cr |
| **Semester 6** | |
| Major specialization elective | 3 |
| SSCI 493 (internship) or extra free elective | 3 |
| Humanities 3XX | 3 |
| IPRO | 3 |
| Minor Requirement—EG 425 (Computer Graphics for non-engineers) | 3 |
| | 15 cr |
| **Semester 7** | |
| STS **Capstone** | 3 |
| Major specialization elective | 3 |
| IPRO | 3 |
| Social Science 3XX | 3 |

| | |
|---|---|
| Minor Requirement EG 429 (Computer Graphics for Desktop Publishing) | 3 |
| Free elective | 3 |
| | 18 cr |
| **Semester 8** | |
| Major specialization elective | 3 |
| Social Science 3XX | 3 |
| Humanities 3XX or Social Science 3XX | 3 |
| Free elective | 3 |
| Free elective | 3 |
| | 15 cr |
| **Total 128-9 credit hours** | |

## Course Plan: Science, Technology and Society with Information Security minor

| | |
|---|---|
| **Semester 1** | |
| LCHS 100 | 2 |
| HUM 2XX | 3 |
| LCHS 2XX: Introduction to Science, Technology and Society | 3 |
| MATH 180 | 3 |
| CS 105 or 110 | 2 |
| Natural Science or Engineering Elective | 3 |
| | 16 cr |
| **Semester 2** | |
| Social Science 2XX or 3XX | 3 |
| SSCI 209: Research Methods | 3 |
| Natural Science or Engineering Elective | 4 |
| Statistics (PSYCH 203, BUS 221 or MATH 225) | 3-4 |
| Major specialization requirement | 3 |
| | 16-17 cr |
| **Semester 3** | |
| PS 332: Politics of Science & Tech | 3 |
| SSCI 385: Computational Social Science | 3 |
| SOC 301 or 303 or PHIL 351 | 3 |
| Natural Science or Engineering Elective | 3 |
| ITMD 421: Data Modeling and Applications | 3 |
| Major specialization elective | 3 |
| | 18 cr |
| **Semester 4** | |
| Methods course | 3 |
| SOC 322: Sociology of Objects and Technology | 3 |
| HUM 380: History of Science OR HIST 375: History of Computing | 3 |
| ITMS 428: Database Security | 3 |
| Major specialization elective | 3 |
| | 15 cr |
| **Semester 5** | |
| SOC 302: Science and Belief | 3 |
| PHIL 360: Ethics | 3 |
| Free elective | 3 |
| Humanities 3XX | 3 |
| ITMO 440: Intro to Data Networks and the Internet | 3 |
| | 15 cr |
| **Semester 6** | |
| SSCI 493 (internship) or extra free elective | 3 |
| Humanities 3XX | 3 |
| IPRO | 3 |
| ITMS 448: Cyber Security Technologies | 3 |
| Free elective | 3 |
| | 18 cr |
| **Semester 7** | |
| STS Capstone | 3 |
| Major specialization elective | 3 |
| IPRO | 3 |
| Social Science 3XX | 3 |
| ITMS 478: Cyber Security Management | 3 |
| | 15 cr |

| **Semester 8** | |
|---|---|
| Major specialization elective | 3 |
| Social Science 3XX | 3 |
| Humanities 3XX or Social Science 3XX | 3 |
| Free elective | 3 |
| Free elective | 3 |
| | 15 cr |
| **Total 128-9 credit hours** | |

## Course Plan: Science, Technology and Society (Applied Math)

| **Semester 1** | |
|---|---|
| LCHS 100 | 2 |
| HUM 2XX | 3 |
| LCHS 2XX: Introduction to Science, Technology and Society (STS) | 3 |
| MATH 151 | 4 |
| CS 105 or 110 | 2 |
| Natural Science or Engineering Elective | 3 |
| | 17 cr |
| **Semester 2** | |
| Social Science 2XX or 3XX | 3 |
| SSCI 209: Research Methods (STS core) | 3 |
| Natural Science or Engineering Elective | 4 |
| Minor Prerequisite—MATH 152 | 5 |
| Major specialization elective | 3 |
| | 18 cr |
| **Semester 3** | |
| PS 332: Politics of Science & Tech (STS core) | 3 |
| Social Science Methods requirement 1 (STS core) | 3 |
| SOC 301 or 303 or PHIL 351 (STS core) | 3 |
| Natural Science or Engineering Elective | 3 |
| Minor Prerequisite—MATH 251 | 5 |
| | 17cr |
| **Semester 4** | |
| Social Science Methods requirement 2 (STS core) | 3 |
| SOC 322: Sociology of Objects and Technology (STS core) | 3 |
| HUM 380: History of Science OR HIST 375: History of Computing (STS core) | 3 |
| Major specialization elective | 3 |
| Minor requirement—MATH 230 | 3 |
| | 15 cr |
| **Semester 5** | |
| SOC 302: Science and Belief (STS core) | 3 |
| PHIL 360: Ethics (STS core) | 3 |
| Major specialization elective— | 3 |
| Humanities 3XX | 3 |
| Minor Requirement—MATH 252 | 3 |
| | 15 cr |
| **Semester 6** | |
| SSCI 493 (internship) or extra free elective | 3 |
| Humanities 3XX | 3 |
| IPRO | 3 |
| Minor Requirement—MATH 332 | 3 |
| Free elective | 3 |
| | 15 cr |
| **Semester 7** | |
| STS **Capstone** | 3 |
| Major specialization elective | 3 |
| IPRO | 3 |
| Social Science 3XX | 3 |
| Minor Requirement—MATH 4xx | 3 |
| Free elective | 3 |
| | 18 cr |

| **Semester 8** | |
|---|---|
| Major specialization elective | 3 |
| Social Science 3XX | 3 |
| Humanities 3XX or Social Science 3XX | 3 |
| Minor Requirement—MATH 4xx | 3 |
| Free elective | 3 |
| | 15 cr |
| **Min Total 130 credit hours** | |

## APPENDIX: ADVISING GUIDE ON STEM MINOR REQUIREMENTS

**This is a list of STEM minor requirements, including course commonality with majors in each discipline, and minor prerequisites (recommended minors are bolded, others on this list are suitable for certain categories of student, and minors omitted from this list generally have significantly higher prerequisites and/or schedule conflicts). The minor in Premedical Studies is also admissible, but advising considerations generally require an early declaration of this course of study and the extensive prerequisites are not listed in this guide; see the Biology minor listing for basic biology and organic chemistry prerequisites in this field. Any STEM minor or 15 credits of STEM content is eligible; however, non-recommended paths of study carry heightened risk of lengthening the time to graduate beyond four years due to the extra credit load and potential issues with scheduling.**

| Minor | Commonality with major | Extra prerequisites (these generally consume elective or, where permissible, core course slots) |
|---|---|---|
| **Applied Mathematics** | Yes (but note MATH 425 does not count toward minor) | 9 credits.<br>MATH 152/ MATH 151 with C or higher/MATH 251 |
| **Architecture** | Yes | No |
| **Artificial Intelligence** | Yes, with Computer Science (except CS 201) | 9 credits and up.<br>CS 104 or 105 or 110 or 115 (Before CS 201); CS 201 or 116 before 330; MATH 474 (calculus track) or CS 401-and-402 |
| **Biochemistry** | Yes | 15 credits<br>BIOL 107 or 114 or 115; CHEM 237 after CHEM 125 after CHEM 124-or-placement; CHEM 239 |
| **Biology** | Yes | 9 to 12 credits<br>CHEM 237 after CHEM 125 after CHEM124 or placement. CHEM 239 for some upper level options |
| Circuits and Systems | | 12-15 credits<br>MATH 252; MATH 251; MATH 152; 151; concurrent registration recommended with MATH 252 and ECE 218; MATH 374 (if taking Signals Digital Data Comm spec); |
| **Computer Networking** | CS 201 and CS 455 not common with major | 6 to 9 credits.<br>CS 104 or 105 or 110 or 115 (Before CS 201); (CS 201 or 116 before 331 and 350); CS 351 or 401-402 track or 403 before CS 350 |
| **Construction Management** | Yes | None |
| **Cyber Security Foundations** | All but ITM 311 with ITM major; All with BS in Applied Cyber and Information Tech | 3 credits<br>ITM 312 (before 411—should also take 311 before 411) |

| Minor | Commonality with major | Extra prerequisites (these generally consume elective or, where permissible, core course slots) |
|---|---|---|
| **Database Management** | 331 and 425 exist in BS degree; 331 in CS BS degree; others must be taken separately | 6 credits<br>CS 104 or 105 or 110 or 115 (for 201)/CS 116 or 201 (for 331) |
| **Food Science and Nutrition** | No, only available as minor | 3 credits<br>BIOL 107 or 115 |
| **Industrial Technology and Management** | Yes | None |
| **Information Security** | For BS Cybersecurity, ITMS428 not in major, otherwise Yes. | None |
| Physics | Yes. NOTE, likely suitable only for internal transfer students | 24 credits.<br>MATH 252 after MATH 251 after MATH 152 after MATH 151 after MATH 148 or "preparation for Calculus placement" (before PHYS 301); PHYS 224 and PHYS 223 (before PHYS 308); PHYS 221 (before PHYS 223 but after MATH 152) |
| Software Engineering | No; only 6 credit overlap (331 and 487). NOTE, may be challenging for transfers | 12 to 15 credits.<br>CS 104 or 105 or 110 or 115 with minimum C (before 201)/CS 425 (before 487)/CS 350/ CS 351 or (401 and 402) prior to 442/ |
| **Statistics** | Yes | 9 credits.<br>MATH 251/MATH 152/MATH 151 (all before MATH 332) |