B A C H E L O R O F S C I E N C E I N

Technology, Society, and Innovation

Lead what comes next.

A Comprehensive Program Proposal

124 Credit Hours | Four-Year Undergraduate Degree
Joint Venture: College of Engineering & School of Business
With affiliations to Arts & Sciences and Public Policy

March 2026
Version 3.0 | Program Development Draft

EXECUTIVE SUMMARY

The Bachelor of Science in Technology, Society, and Innovation (TSI) is a four-year undergraduate degree program designed for a research university, jointly administered by the College of Engineering and the School of Business with formal affiliations to Arts and Sciences and Public Policy.

The Problem TSI Addresses: Organizations across every sector face a critical shortage of professionals who can bridge the gap between technical teams and business, legal, ethical, and policy stakeholders. Software engineers who cannot explain their work to executives. Business leaders who cannot evaluate technical proposals. Policy analysts who do not understand the technology they regulate. The professionals who can operate across these boundaries are among the most sought-after and highest-compensated in the technology economy.

The TSI Solution: A 124-credit, interdisciplinary curriculum organized around five thematic strands — Sociotechnical Foundations, Technical Fluency, Ethics/Policy/Governance, Innovation and Strategy, and Design and Leadership — that develops integrated expertise rather than additive knowledge. TSI graduates do not merely take courses in multiple disciplines; they learn to think, design, and lead at their intersection. The curriculum engages with technology transitions around AI system design and orchestration, biotechnology, autonomous systems, quantum computing, and climate technology, and more. But it is deliberately built to outlast any single technology cycle: three-quarters of the program develops durable capabilities — systems thinking, ethical reasoning, strategic analysis, human-centered design, and adaptive leadership — while the technical strand evolves annually to reflect the current frontier.

Key Program Features:

1. **18-course core curriculum** organized in five thematic strands spanning all four years
2. **Four concentration tracks:** AI Governance and Policy, Product and Innovation Management, Human-Centered Technology Design, and Technology Strategy and Entrepreneurship
3. **8 program-level learning outcomes** mapped to every course, assessment, and career pathway using Backward Design and Bloom's Taxonomy
4. **Integrated ethics from Year 1** — a three-course ethics/policy/governance strand, not a single bolt-on course
5. **Designed for durability** — 75% of the curriculum builds on discipline-grounded capabilities (systems thinking, ethical reasoning, design, strategy, leadership) that transfer across technology transitions, while technical courses undergo annual review to stay current
6. **Year-long industry-sponsored capstone** producing professional-quality deliverables
7. **Cumulative professional portfolio** with 10 curated artifacts across four years
8. **Required summer internship** with structured reflection and faculty supervision

Career Outcomes: TSI graduates are expected to enter product management, AI governance, technology strategy consulting, UX research, digital transformation leadership, and related roles. Entry-level salaries for primary career pathways will likely range from $70K-$115K, with mid-career trajectories reaching $140K-$230K depending on pathway and performance.

Competitive Differentiation: No existing undergraduate program combines AI governance at the undergraduate level, a four-course design and leadership strand, integrated ethics from Year 1, a year-long industry capstone, and portfolio-based assessment under one interdisciplinary roof. The closest comparisons — USC Iovine Young, Stanford Symbolic Systems, CMU HCI — each address portions of this space but not the full integration TSI offers.

Implementation: The program requires 8-10 core faculty (plus 6-8 adjunct/affiliated), is projected to launch with a cohort of 40 students, and reach steady state at 250-300 students within five years. Estimated annual operating costs at steady state are $1.9M-$3.0M, well within the revenue generated by tuition at most research universities.

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1.1 Program Overview

Degree: Bachelor of Science in Technology, Society, and Innovation (TSI)

Tagline: *"Lead what comes next."*

Total Credits: 124 credit hours

Duration: 4 years (8 semesters + summer internship between Years 3 and 4)

Administrative Home: Jointly administered by the College of Engineering and the School of Business, with formal affiliations to the College of Arts & Sciences and the School of Public Policy

Program Leadership: A dedicated TSI Program Director reports to both deans (Engineering and Business) and chairs an interdisciplinary advisory committee with representatives from all four affiliated units

1.2 Mission and Vision

Prepare the next generation of leaders who can navigate, shape, and govern technology transitions by integrating technical fluency, human-centered design, ethical reasoning, strategic thinking, and adaptive leadership. TSI graduates don't just understand technology — they understand how technology transforms organizations, societies, and lives, and they lead that transformation responsibly.

To be the premier undergraduate program for students who want to lead at the intersection of technology and society — producing graduates who are as comfortable evaluating an AI system's architecture or a cloud infrastructure design as they are debating technology policy, as skilled at building prototypes as they are at crafting business strategies.

1.3 How TSI Is Different: Competitive Differentiation

The TSI degree occupies a distinctive position in the higher education landscape. While several peer institutions have launched interdisciplinary technology programs, none combines the breadth and depth of the TSI curriculum.

TSI vs. USC Iovine and Young Academy

The Iovine and Young Academy at USC blends arts, technology, and entrepreneurship but treats technical depth as secondary to creative vision. TSI provides deeper technical foundations — students complete a full computational sequence through machine learning, data science, and computational systems — and explicitly integrates technology governance and policy as core curricular strands, not elective add-ons. TSI students graduate with demonstrable coding, data science, and AI orchestration skills alongside their design and strategy capabilities.

TSI vs. Stanford Symbolic Systems

Stanford's Symbolic Systems program offers rigorous cognitive science and computational foundations but lacks structured business and leadership integration. TSI weaves strategy, organizational change, and adaptive leadership throughout the four-year curriculum, preparing graduates not just to analyze human-technology interaction but to lead organizations through technology transitions.

TSI vs. Carnegie Mellon Human-Computer Interaction

CMU's HCI program is world-class in interface design and user research but remains focused on the design of interactive systems. TSI takes a substantially broader scope: students engage with technology policy, business model innovation, organizational transformation, and ethics governance — preparing them for roles that extend well beyond the design studio into the boardroom, the policy office, and the startup.

TSI vs. Northwestern Manufacturing and Design Engineering (MaDE)

Northwestern's MaDE program integrates design thinking with engineering but maintains a manufacturing orientation. TSI provides a stronger foundational technical sequence in computing and AI while embedding ethics and governance as non-negotiable curricular threads. The TSI capstone is industry-sponsored and year-long, offering deeper professional preparation than a single-semester project.

TSI vs. Olin College of Engineering

Olin's project-based engineering education is innovative but limited by a small-college scale. TSI leverages the full resources of a major research university — access to large-scale research labs, industry partnerships, policy centers, and a broad general education curriculum — while maintaining Olin's commitment to hands-on learning. TSI also offers formal concentration tracks that Olin's unitary curriculum does not.

TSI vs. ASU School for the Future of Innovation in Society

ASU's program emphasizes responsible innovation and STS (science, technology, and society) perspectives but with less technical and business coursework than TSI. TSI students complete a rigorous computational sequence, a full innovation and strategy strand, and a design strand — ensuring they can build, not just critique.

What Makes TSI Unique

No existing program combines all of the following:

9. **Integrated ethics and policy from Year 1:** Ethics is not a single required course bolted on in the junior year. It is a three-course strand (TSI 130, 230, 330) that runs from first year through junior year, with ethical reasoning woven into technical, design, and strategy courses throughout all four years.

10. **AI governance at the undergraduate level:** TSI 330 (AI Governance and Responsible Innovation) gives undergraduates structured preparation in a field currently taught almost

exclusively at the graduate level, with the AI Governance concentration providing even deeper specialization.

11. **Four-course Design and Leadership strand:** The Design and Leadership strand (TSI 120 –> 220 –> 250 –> 350) is a four-course sequence that provides sustained, scaffolded instruction in human-centered design, prototyping, team leadership, facilitation, conflict resolution, and adaptive leadership. This is stronger than comparable strands at peer institutions, where design and leadership are typically addressed in one or two courses. The addition of TSI 220 (Design and Prototyping for Technology Leaders) and TSI 350 (Applied Leadership Practicum) directly addresses the concern that design and leadership were under-resourced in earlier program drafts.
12. **Year-long, industry-sponsored capstone:** The two-semester capstone sequence (TSI 491 + TSI 492) partners student teams with real organizations to address genuine technology-society challenges, producing portfolio-quality deliverables and professional relationships.
13. **Portfolio-based assessment throughout:** From the first semester, students build a cumulative professional portfolio with artifacts mapped to program learning outcomes, creating both a powerful job-search tool and a rich data source for program assessment.
14. **Four concentration tracks:** Students declare a concentration by the end of Year 2 (AI Governance and Policy, Product and Innovation Management, Human-Centered Technology Design, or Technology Strategy and Entrepreneurship), allowing meaningful depth while preserving the integrative core.

1.4 Designed for Durability: Why This Program Will Still Matter in 2035

Technology programs face a fundamental tension: they must be current enough to be useful and durable enough to justify a four-year investment. TSI resolves this through a deliberate architectural choice — the program teaches *through* current technologies, not *about* them.

The durable layer (75% of the curriculum) consists of capabilities that have remained essential across every technology transition of the past fifty years: systems thinking, ethical reasoning, organizational change management, strategic analysis, human-centered design, leadership, and communication. These disciplines are grounded in decades of scholarship and professional practice. A student who mastered systems thinking in 1995 could apply it to the internet, to mobile platforms, to cloud computing, and to AI — because the analytical framework transfers even as the subject matter changes.

The current layer (25% of the curriculum) teaches students to work with today's most important technologies — currently AI and data systems — not because these specific technologies are permanent, but because working with real systems develops judgment that abstractions alone cannot. The specific tools, libraries, and platforms referenced in course syllabi are explicitly treated as exemplars that are updated on an annual review cycle. The program's value comes from the analytical and leadership capabilities built through working with these technologies, not from mastery of any particular tool.

Structural safeguards against obsolescence:

- **Annual syllabus review:** Technical courses (Strand B) undergo annual review by the Curriculum Committee to update tools, platforms, and application patterns. The learning objectives remain stable; the implementations evolve.
- **Principles over tools:** Course learning objectives are written at the level of capabilities ("design and evaluate an AI-powered system") rather than tools ("use PyTorch and Hugging Face"). This allows tool substitution without objective revision.
- **Broad technology exposure:** While AI is the dominant exemplar, courses in systems thinking (TSI 310), technology policy (TSI 230), and technology futures (TSI 410) deliberately engage with biotechnology, quantum computing, climate technology, robotics, and other frontier domains — ensuring graduates are prepared for technology transitions beyond AI.
- **Meta-learning emphasis:** The foresight course (TSI 410) and the capstone explicitly train students to anticipate, analyze, and adapt to technology transitions they cannot yet predict — the most durable skill of all.

1.5 Program Design Philosophy

The TSI curriculum is built on established principles of curriculum design, instructional theory, and inclusive pedagogy.

Backward Design (Wiggins & McTighe)

The curriculum was designed backward from desired results. We began by defining the TSI Graduate Profile and eight Program-Level Learning Outcomes (PLOs), then identified the evidence required to demonstrate those outcomes (assessments and portfolio artifacts), and only then designed the learning experiences (courses, projects, and experiential components). Every course exists because it is necessary to develop and assess one or more PLOs.

Bloom's Taxonomy Progression

The four-year sequence deliberately scaffolds cognitive complexity:

- **Year 1 (Remember, Understand, Apply):** Students build foundational knowledge and vocabulary across all five thematic strands. They learn to identify, describe, and apply core concepts in computing, design thinking, ethics, systems thinking, and business.
- **Year 2 (Apply, Analyze):** Students begin applying knowledge to structured problems and analyzing real-world cases. Courses introduce analytical frameworks and require students to break down complex situations into component parts.
- **Year 3 (Analyze, Evaluate):** Students confront ambiguous, multi-stakeholder problems. They evaluate competing technical, ethical, and strategic approaches and synthesize evidence from multiple domains to form judgments.
- **Year 4 (Evaluate, Create):** The capstone and senior seminar require students to create original solutions to real-world problems and evaluate their work against professional standards. Students operate as junior professionals.

Constructive Alignment (Biggs)

Every course in the TSI curriculum maintains constructive alignment: learning outcomes, teaching and learning activities, and assessment tasks are deliberately aligned. The PLO-to-course mapping matrix ensures that program-level outcomes are systematically addressed, and course-level outcomes explicitly trace to one or more PLOs.

Kolb's Experiential Learning Cycle

TSI pedagogy moves students through all four phases of Kolb's cycle — concrete experience, reflective observation, abstract conceptualization, and active experimentation — in every project-based course. The curriculum provides increasingly complex experiential learning opportunities: structured exercises in Year 1, team projects with external stakeholders in Year 2, the summer internship in Year 3, and the year-long capstone in Year 4.

Inclusive Pedagogy

The program is designed to welcome students from all backgrounds, not only those who arrived on campus already coding. Specific inclusive design choices include:

- **Multiple entry points:** TSI 110 (Computational Thinking) assumes no prior programming experience. The technical strand builds from zero.
- **Collaborative learning structures:** Team projects use structured roles, peer evaluation, and conflict resolution protocols to ensure equitable participation.
- **Diverse assessment methods:** Students demonstrate competence through writing, coding, presentations, design artifacts, policy briefs, and reflective essays — not exclusively through exams.
- **Representation in content:** Case studies, guest speakers, and readings deliberately represent diverse perspectives, geographies, and communities affected by technology.
- **Universal Design for Learning (UDL):** Course materials provide multiple means of engagement, representation, and action/expression.

Five Thematic Strands

The curriculum is organized around five thematic strands that provide vertical coherence from Year 1 through Year 4:

Strand	Theme	Core Sequence
A	Sociotechnical Foundations	TSI 101 –> 210 –> 310 –> 410
B	Technical Fluency	TSI 110 –> 212 –> 211 –> 311
C	Ethics, Policy, and Governance	TSI 130 –> 230 –> 330
D	Innovation and Strategy	TSI 140 –> 240 –> 340

Strand	Theme	Core Sequence
E	Design and Leadership	TSI 120 –> 220 –> 250 –> 350

Each strand has its own internal logic and progression, but strands are designed to interact. A student studying data ethics in Strand C draws on technical knowledge from Strand B and systems thinking from Strand A. A capstone team applies skills from all five strands simultaneously.

1.6 Who This Program Is For

The Ideal TSI Student

The TSI program is designed for students who are:

- **Intellectually curious across disciplines.** They read about artificial intelligence, biotechnology, and political philosophy. They are as interested in how a recommendation algorithm or a gene therapy works as they are in how these technologies change what people believe and how societies function. They do not want to be confined to a single department.
- **Interested in both how technology works and what it means.** They want technical fluency — they want to code, to work with data, to understand how AI systems and other emerging technologies work — but they also want to think critically about technology's effects on individuals, organizations, and societies. They reject the false choice between being technical and being thoughtful.
- **Entrepreneurial in spirit, if not necessarily in ambition.** They are drawn to creating new things, whether that means launching a startup, redesigning a government service, building a new product, or starting a nonprofit. They are comfortable with iteration, feedback, and the possibility of failure.
- **Drawn to ambiguity and complexity.** They do not expect clean answers. They are energized, not paralyzed, by problems that cross disciplinary boundaries, involve competing stakeholder interests, and require judgment calls without perfect information.
- **Motivated to lead, not just build.** They want to be the person in the room who can translate between engineers and executives, between technologists and policymakers, between designers and communities. They aspire to roles where they shape direction, not just execute tasks.

Who TSI Is Not For

TSI is not a substitute for a computer science degree for students who want to become software engineers writing production code. It is not a substitute for an engineering degree for students who want to design bridges or circuits. It is not a substitute for an MBA for students who want a credential focused primarily on finance and accounting. TSI students learn to code, to design, and to think strategically — but the goal is integration and leadership, not disciplinary depth in any single field.

Technical Messaging

When describing the TSI graduate's technical profile, the program leads with what graduates *can* do rather than what they are not. TSI graduates can build a technology prototype — whether an AI system, a data platform, or a digital service — audit it for fairness and risk, design the user experience, write the business case, and present to the board — a combination no single traditional degree provides. This integrated capability set is the program's core value proposition: not depth in one discipline, but professional-grade fluency across the disciplines that matter most for technology leadership.

1.7 The TSI Graduate Profile

A graduate of the B.S. in Technology, Society, and Innovation is a distinctive professional who integrates capabilities that are rarely found in a single individual.

Technically Literate

TSI graduates understand how technologies work — not just what they do, but why they are built the way they are, where they are fragile, and what they make possible. They can write code in Python, work effectively with AI-powered development tools, clean and analyze datasets, create interactive prototypes, and read technical documentation with comprehension. They can evaluate a technical architecture, assess the feasibility of a proposed system, and ask the right questions of an engineering team. They are not software engineers, but they are technically credible — when they lead technical teams, they lead with understanding, not just authority.

Ethically Grounded

TSI graduates have studied ethics not as an abstract philosophical exercise but as a practical discipline applied to real technology decisions. They can identify ethical tensions in product design, data collection, algorithmic decision-making, and technology policy. They are familiar with multiple ethical frameworks — consequentialist, deontological, virtue ethics, care ethics, justice-oriented — and can apply them to novel situations. They have practiced making and defending difficult ethical judgments in ambiguous contexts.

Strategically Minded

TSI graduates understand how organizations create, deliver, and capture value. They can analyze business models, assess market dynamics, develop go-to-market strategies, and lead organizational change. They understand the difference between sustaining and disruptive innovation, can evaluate build-vs-buy decisions, and can construct a compelling business case for technology investment. They think in terms of ecosystems, platforms, and stakeholder networks, not just products.

Design-Thinking

TSI graduates are trained in human-centered design. They can conduct user research, synthesize insights into design requirements, create and test prototypes, and iterate based on feedback. They understand that good technology begins with deep empathy for the people who will use it and the communities it will affect. They approach problems as designers: divergent before convergent, generative before evaluative, human before technical.

Leadership-Capable

TSI graduates have explicit training and practice in leading teams through ambiguity. They can facilitate productive meetings, navigate conflict, give and receive feedback, and adapt their leadership style to the needs of the situation. They have led cross-functional project teams and have been evaluated by their peers on their leadership effectiveness. They understand that leadership is a practice, not a position.

Portfolio-Equipped

Every TSI graduate leaves the program with a professional portfolio containing artifacts that demonstrate competence across all eight program learning outcomes. The portfolio includes systems analyses, design projects, policy briefs, business strategies, technical projects, communication samples, leadership reflections, and the capstone deliverable. This portfolio is both a job-search tool and a record of intellectual development.

Career-Ready

TSI graduates are prepared for roles including but not limited to:

- Product Manager
- Technology Strategy Consultant
- AI Governance / Responsible AI Specialist
- UX Researcher / Designer
- AI Systems Architect
- Digital Transformation Lead
- Technology Policy Analyst
- Innovation Manager
- Venture Capital / Startup Analyst
- Chief of Staff (Technology Organization)

They are also well-prepared for graduate study in technology management, public policy, law, design, information science, or business administration.

1.8 Skills and Tools Inventory — What Graduates Can Put on a Resume

The following skills are genuinely taught and practiced in the TSI curriculum. Each entry references the specific courses where the skill is developed.

Technical Skills

- **Programming:** Python (data manipulation, visualization, and ML using industry-standard libraries such as pandas, matplotlib, and scikit-learn), AI-augmented development workflows — TSI 110, 211, 212, 311

- **Data Analysis:** Exploratory data analysis, statistical inference, hypothesis testing, regression, A/B testing design and analysis — TSI 211
- **AI/Machine Learning:** Supervised and unsupervised learning, neural networks, AI application patterns (e.g., retrieval-augmented generation, agentic workflows, tool use), model evaluation and fairness auditing — TSI 212, 311
- **AI Systems Design:** Multi-agent orchestration, AI system composition and evaluation, human-AI interaction design, AI-native application architecture — TSI 311
- **Data Tools:** SQL basics, Jupyter notebooks, data cleaning and transformation — TSI 211, 212
- **Version Control:** Git and collaborative coding workflows — TSI 110

Design Skills

- **Design Tools:** Industry-standard prototyping tools (currently Figma), paper and digital prototyping — TSI 120, 220
- **Research Methods:** User interviews, contextual inquiry, usability testing, survey design, diary studies — TSI 120, 220, concentration courses
- **Design Frameworks:** Design thinking (double diamond), service blueprints, journey mapping, personas, information architecture — TSI 120, 220
- **Accessibility:** WCAG 2.2 fundamentals, accessibility auditing — TSI 220, concentration courses

Business and Strategy Skills

- **Business Analysis:** Financial statement interpretation, unit economics (CAC, LTV, MRR), competitive analysis (Porter's Five Forces, SWOT) — TSI 140
- **Business Model Design:** Business Model Canvas, lean startup methodology, customer discovery — TSI 140, 240
- **Strategy Frameworks:** Platform strategy, ecosystem analysis, technology adoption lifecycle, scenario planning — TSI 340, 410
- **Innovation Methods:** Design sprints, MVP development, pivot decision frameworks — TSI 240

Governance and Policy Skills

- **Policy Analysis:** Regulatory analysis, policy brief writing, stakeholder mapping — TSI 230
- **Technology Governance:** Algorithmic impact assessment, risk management framework application (e.g., NIST AI RMF), regulatory compliance analysis, documentation standards (e.g., model cards, datasheets) — TSI 330
- **Ethics Frameworks:** Utilitarian, deontological, virtue ethics, care ethics applied to technology decisions — TSI 130

Leadership and Communication Skills

- **Team Leadership:** Facilitation, negotiation, conflict resolution, 360-degree assessment — TSI 250, 350
- **Client Management:** Scoping, deliverable management, stakeholder communication — TSI 350
- **Presentation:** Pitch decks, executive briefings, public defense of complex work — across all courses
- **Professional Writing:** Policy briefs, case analyses, strategy documents, research reports — across all courses

Systems and Analytical Skills

- **Systems Thinking:** Causal loop diagrams, stock-and-flow models, stakeholder mapping, network analysis — TSI 101, 310
- **Foresight Methods:** Scenario planning, horizon scanning, technology roadmapping, Three Horizons Framework, backcasting, Wardley Mapping — TSI 410
- **Computational Modeling:** Agent-based modeling (e.g., NetLogo), network analysis, simulation of complex systems — TSI 310

1.9 Program Governance

Administrative Structure

The TSI Program Director is a full-time faculty appointment (tenured or tenure-track) who reports jointly to the Dean of the College of Engineering and the Dean of the School of Business. The Director chairs the TSI Curriculum Committee, which includes:

- Two faculty representatives from Engineering
- Two faculty representatives from Business
- One faculty representative from Arts & Sciences
- One faculty representative from Public Policy
- One industry advisory board member (rotating)
- Two student representatives (one junior, one senior)
- The TSI Director of Experiential Learning (ex officio)

Industry Advisory Board

A 15-20 member Industry Advisory Board meets twice annually to review curriculum relevance, provide capstone project sponsorships, facilitate internship placements, and advise on emerging workforce needs. Board members are senior leaders from technology companies, consulting firms, policy organizations, and startups.

Assessment and Continuous Improvement

The program follows a continuous improvement cycle aligned with ABET and AACSB expectations (given the joint Engineering-Business administration):

1. **Annual portfolio review:** A faculty committee reviews a stratified sample of student portfolios each spring, scoring artifacts against PLO rubrics.
2. **Capstone evaluation:** Industry sponsors and faculty evaluate capstone deliverables against program-level rubrics.
3. **Stakeholder feedback:** Annual surveys of students, alumni (beginning Year 2 post-graduation), employers, and industry advisory board members.
4. **Curriculum retreat:** An annual faculty retreat reviews assessment data and proposes curriculum modifications.
5. **External review:** A comprehensive external review every five years by a panel of peer program directors and industry leaders.

2 Curriculum Architecture

2.1 Program-Level Learning Outcomes (PLOs)

2.1.1 Overview

The TSI program defines eight Program-Level Learning Outcomes (PLOs) that collectively describe what every graduate will know and be able to do. These outcomes were developed using Backward Design (Wiggins & McTighe): we began with the TSI Graduate Profile, identified the competencies that profile requires, and then articulated measurable outcomes at the program level.

Each PLO is assessed through multiple courses and culminates in the senior capstone and professional portfolio. The outcomes span the upper levels of Bloom's Taxonomy (Apply through Create), with deliberate scaffolding from lower cognitive levels in Years 1-2 to higher levels in Years 3-4.

2.1.2 The Eight Program-Level Learning Outcomes

PLO-1: Evaluate Complex Sociotechnical Systems

Full Statement: Evaluate complex sociotechnical systems by analyzing the interplay of technology, human behavior, organizational dynamics, and policy constraints to identify leverage points for intervention.

Attribute	Detail
Bloom's Level	Evaluate
Primary Courses	TSI 101, TSI 210, TSI 310, TSI 410
Supporting Courses	TSI 130, TSI 240, Capstone
Career Mapping	All pathways; especially Technology Strategy, Digital Transformation, AI Systems Architect
Assessment Method	Systems analysis portfolio artifact; capstone systems evaluation component

What this means in practice: A TSI graduate can take a complex situation — such as a hospital adopting an AI diagnostic tool, a city modernizing its transportation infrastructure, or an organization migrating to cloud-based services — and systematically map the technical components, human actors, organizational incentives, regulatory constraints, and feedback loops. They can identify where the system is fragile, where interventions would be most effective, and what unintended consequences might arise.

Scaffolding across years: - Year 1 (TSI 101): Students learn systems thinking vocabulary and frameworks. They can identify components and relationships in a sociotechnical system. *(Remember, Understand)* - Year 2 (TSI 210): Students apply systems frameworks to analyze real-world cases, producing structured analyses. *(Apply, Analyze)* - Year 3 (TSI 310): Students evaluate competing interventions in complex systems, weighing trade-offs and second-order effects. *(Analyze, Evaluate)* - Year 4 (TSI 410): Students conduct original systems evaluations for their capstone organizations, producing professional-grade analyses. *(Evaluate, Create)*

PLO-2: Design Technology-Enabled Solutions

Full Statement: Design technology-enabled solutions that integrate user needs, technical feasibility, business viability, and ethical considerations using iterative, human-centered design processes.

Attribute	Detail
Bloom's Level	Create
Primary Courses	TSI 120, design track courses, Capstone (TSI 491/492)
Supporting Courses	TSI 110, TSI 211, TSI 140, concentration electives
Career Mapping	Product Management, UX Research, Human-Centered Design, Digital Transformation
Assessment Method	Design portfolio with iterative process documentation; capstone design deliverable

What this means in practice: A TSI graduate can lead a design process from problem discovery through prototyping and testing. They conduct user research (interviews, observations, surveys), synthesize findings into actionable insights, generate and evaluate concepts, build functional prototypes, and iterate based on testing. Critically, their designs account not only for user desirability but also for technical feasibility, business viability, and ethical implications.

Scaffolding across years: - Year 1 (TSI 120): Students learn the fundamentals of design thinking and human-centered design. They complete structured design sprints with scaffolded steps. *(Understand, Apply)* - Year 2 (TSI 220): **All students** receive intermediate design instruction through TSI 220 (Design and Prototyping for Technology Leaders), which covers prototyping tools, design critique, and ethical design considerations including dark patterns. Students integrate technical and business feasibility considerations into design work. *(Apply, Analyze)* - Year 3 (Design track): Students in the Human-Centered Technology Design concentration lead advanced design projects addressing complex multi-stakeholder challenges, evaluating trade-offs between desirability, feasibility, viability, and ethics. *(Analyze, Evaluate)* - Year 4 (Capstone): Students design and build solutions for industry sponsors, operating as professional design teams. *(Evaluate, Create)*

PLO-3: Construct Evidence-Based Arguments

Full Statement: Construct evidence-based arguments about technology governance, policy, and ethics by synthesizing technical knowledge, stakeholder perspectives, and philosophical frameworks.

Attribute	Detail
Bloom's Level	Create

Attribute	Detail
Primary Courses	TSI 130, TSI 230, TSI 330, Capstone (TSI 491/492)
Supporting Courses	TSI 101, TSI 210, TSI 310
Career Mapping	AI Governance, Responsible AI, Policy Analyst, Regulatory Affairs, Chief AI Officer
Assessment Method	Policy brief portfolio; ethics case analysis; capstone governance component

What this means in practice: A TSI graduate can write a policy brief on a technology governance issue — say, regulating foundation models, governing critical infrastructure cybersecurity, or establishing data sovereignty frameworks — that demonstrates command of the technical realities, awareness of diverse stakeholder interests, grounding in ethical theory, and knowledge of regulatory precedent. They can defend their position under questioning and acknowledge the strongest counterarguments.

Scaffolding across years: - Year 1 (TSI 130): Students learn foundational ethical frameworks and apply them to technology case studies. They can identify ethical tensions and articulate different perspectives. *(Understand, Apply)* - Year 2 (TSI 230): Students analyze real governance challenges, mapping stakeholder interests and evaluating existing policies. They write structured policy analyses. *(Apply, Analyze)* - Year 3 (TSI 330): Students engage with AI governance specifically, grappling with regulatory design, algorithmic accountability, and international governance coordination. They produce original policy briefs. *(Analyze, Evaluate)* - Year 4 (Capstone): Students address governance and policy dimensions of their capstone projects, constructing evidence-based recommendations that integrate technical, ethical, and stakeholder perspectives. *(Evaluate, Create)*

PLO-4: Formulate and Execute Innovation Strategies

Full Statement: Formulate and execute innovation strategies by applying business model design, market analysis, and organizational change management.

Attribute	Detail
Bloom's Level	Create
Primary Courses	TSI 140, TSI 240, TSI 340, Capstone (TSI 491/492)
Supporting Courses	TSI 210, TSI 310, concentration electives
Career Mapping	Product Management, Technology Strategy, Venture Capital, Entrepreneurship, Innovation Management
Assessment Method	Business plan / strategy deliverable; market analysis report; capstone strategy component

What this means in practice: A TSI graduate can assess a technology opportunity, design a business model, analyze the competitive landscape, develop a go-to-market strategy, and plan for organizational adoption. They understand the dynamics of technology markets — network effects, platform economics, switching costs, winner-take-all dynamics — and can construct strategies that account for these forces.

Scaffolding across years: - Year 1 (TSI 140): Students learn core business and innovation concepts: value creation, business model canvas, lean startup methodology. *(Remember, Understand)* - Year 2 (TSI 240): Students analyze existing technology business models and conduct structured market analyses. They develop and pitch business concepts. *(Apply, Analyze)* - Year 3 (TSI 340): Students develop comprehensive innovation strategies for complex organizational contexts, integrating change management and stakeholder alignment. *(Analyze, Evaluate)* - Year 4 (Capstone): Students develop and execute strategy for their capstone organization, with real stakeholder buy-in and implementation planning. *(Evaluate, Create)*

PLO-5: Develop and Deploy Computational Artifacts

Full Statement: Develop and deploy computational and data-driven artifacts demonstrating proficiency in programming, data analysis, and AI/ML concepts.

Attribute	Detail
Bloom's Level	Create
Primary Courses	TSI 110, TSI 211, TSI 212, TSI 311, concentration electives
Supporting Courses	Capstone
Career Mapping	Data Strategy, Product Management, AI Governance, AI Systems Architect
Assessment Method	Technical portfolio with code repositories; coding assignments and projects; capstone technical component

What this means in practice: A TSI graduate can write clean, functional Python code and leverage AI-powered development tools to accelerate their work. They can collect, clean, and analyze data using standard data science libraries and SQL. They can design, evaluate, and orchestrate AI-powered systems — composing pre-trained models, APIs, and agentic workflows into coherent solutions rather than only building models from scratch. They can create interactive web-based prototypes. They can read and understand technical documentation, APIs, and codebases well enough to collaborate with software engineers. Their technical work is documented, version-controlled, and reproducible.

Scaffolding across years: - Year 1 (TSI 110): Students learn computational thinking and Python programming fundamentals, including working with AI coding assistants as development partners. No prior experience assumed. *(Remember, Understand, Apply)* - Year 2 (TSI 211): Students learn data analysis, visualization, and introductory statistics using real datasets. They build data-driven applications. *(Apply, Analyze)* - Year 2 (TSI 212): Students learn AI and machine learning foundations — both how models work and how to compose AI capabilities into applications using APIs, pre-trained models, and agentic patterns. They develop judgment about responsible AI deployment. *(Apply, Analyze)* - Year 3 (TSI 311): Students design, build, and evaluate AI-native systems — orchestrating multi-component architectures, agentic workflows, and human-AI interaction patterns. They critically assess system performance, reliability, and limitations. *(Analyze, Evaluate, Create)*

PLO-6: Communicate Complex Technical Concepts

Full Statement: Communicate complex technical concepts effectively to diverse audiences through written, oral, and visual media.

Attribute	Detail
Bloom's Level	Create
Primary Courses	TSI 101, TSI 120, TSI 250, all project courses, Capstone (TSI 491/492)
Supporting Courses	TSI 130, TSI 230, TSI 340
Career Mapping	All roles; especially Consulting, Leadership, Product Management, Policy
Assessment Method	Communication portfolio (written, oral, visual artifacts); presentation rubrics; peer and instructor feedback

What this means in practice: A TSI graduate can write a clear technical memo, deliver a compelling presentation to non-technical executives, create effective data visualizations, facilitate a workshop, and adapt their communication style to their audience. They understand that communication is not a soft skill but a core professional competency — the ability to translate across technical, business, policy, and public audiences is central to every role TSI graduates will hold.

Note on course mapping: Communication skills are not confined to a single course. Instead, they are developed across the curriculum through deliberate practice in multiple contexts: - TSI 101 (Year 1): Written systems analyses and oral presentations of case studies - TSI 120 (Year 1): Design presentations and visual communication of design concepts - TSI 250 (Year 2): Leadership communication, facilitation, and stakeholder engagement - All project courses: Team presentations, client communications, written reports, and portfolio reflections - Capstone (Year 4): Professional-grade written deliverables, executive presentations, and public showcases

Scaffolding across years: - Year 1: Students practice structured communication formats (memos, presentations, design briefs) with explicit instruction and feedback. *(Apply)* - Year 2: Students communicate to varied audiences (peers, faculty, external stakeholders) and adapt style accordingly. *(Apply, Analyze)* - Year 3: Students communicate about complex, ambiguous topics to diverse and sometimes resistant audiences. *(Analyze, Evaluate)* - Year 4: Students produce professional-quality communication artifacts for industry sponsors and public audiences. *(Evaluate, Create)*

PLO-7: Lead Cross-Functional Teams

Full Statement: Lead cross-functional teams through ambiguity by applying adaptive leadership, facilitation, and conflict resolution.

Attribute	Detail
Bloom's Level	Evaluate / Create
Primary Courses	TSI 120, TSI 250, TSI 350, Capstone (TSI 491/492), all team project courses
Supporting Courses	TSI 340, concentration practica
Career Mapping	All leadership roles; Product Management; Digital Transformation; Consulting
Assessment Method	Team evaluations; 360-degree peer assessments; leadership reflections; leadership portfolio

What this means in practice: A TSI graduate can step into a team of people from different backgrounds and disciplines, establish shared purpose, facilitate productive collaboration, navigate disagreements, and drive the team toward results — especially when the path forward is unclear. They have a personal leadership philosophy grounded in self-awareness, and they can articulate what kind of leader they are and what kind they aspire to become.

Scaffolding across years: - Year 1 (TSI 120): Students work in structured teams with assigned roles and learn basic facilitation and feedback skills. They reflect on their team experiences. *(Understand, Apply)* - Year 2 (TSI 250): Students receive explicit instruction in leadership theory (adaptive leadership, servant leadership, situational leadership) and practice through increasingly complex team challenges. *(Apply, Analyze)* - Year 3 (TSI 350): **All students** take TSI 350 (Applied Leadership Practicum), which provides applied leadership experience through consulting-style engagements with external partners. Students lead project teams with external stakeholders, navigating real ambiguity and organizational dynamics. They receive 360-degree feedback. *(Analyze, Evaluate)* - Year 4 (Capstone): Students lead capstone teams in a year-long engagement with industry sponsors, demonstrating professional-level leadership. *(Evaluate, Create)*

PLO-8: Appraise Emerging Technologies

Full Statement: Appraise emerging technologies for transformative potential, risks, and societal implications using structured foresight methodologies.

Attribute	Detail
Bloom's Level	Evaluate
Primary Courses	TSI 101, TSI 310, TSI 410, Capstone (TSI 491/492)
Supporting Courses	TSI 211, TSI 311, TSI 330
Career Mapping	AI Systems Architect, Chief AI Officer, Responsible Innovation Manager, Technology Strategy, VC

Attribute	Detail
Assessment Method	Technology assessment reports; foresight scenario analyses; capstone foresight component

What this means in practice: A TSI graduate can take an emerging technology — say, neuromorphic computing, synthetic biology, or decentralized identity — and systematically assess its maturity, potential applications, technical limitations, market dynamics, societal risks, and governance needs. They use structured foresight methods (scenario planning, horizon scanning, Three Horizons Framework, technology readiness assessment) rather than relying on hype or gut instinct.

Scaffolding across years: - Year 1 (TSI 101): Students learn to identify and describe emerging technologies and their potential societal implications using basic frameworks. *(Remember, Understand)* - Year 2 (TSI 210): Students apply structured analysis frameworks to assess technology trends and their systemic effects. *(Apply, Analyze)* - Year 3 (TSI 310): Students conduct structured technology assessments using foresight methodologies, evaluating multiple plausible futures. *(Analyze, Evaluate)* - Year 4 (TSI 410, Capstone): Students produce original foresight analyses for their capstone organizations or in the senior seminar, integrating technical, strategic, ethical, and policy perspectives. *(Evaluate, Create)*

2.1.3 PLO-to-Course Mapping Matrix

The following matrix shows which courses address each PLO. **P** indicates a primary contribution (the course explicitly teaches and assesses this outcome). **S** indicates a secondary/supporting contribution (the course reinforces this outcome but does not primarily assess it).

Course	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8
TSI 101 Intro to Sociotechnical Systems	**P**		S			**P**		**P**
TSI 110 Computational Thinking					**P**			
TSI 120 Design Thinking & Innovation		**P**				**P**	**P**	
TSI 130 Ethics of Technology	S		**P**			S		
TSI 140 Business of Technology				**P**		S		
TSI 210 Sociotechnical Systems Analysis	**P**		S	S		S		S
TSI 211 Data Analysis & Visualization					**P**	S		

Course	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8
TSI 212 AI and Machine Learning Foundations			S		**P**			S
TSI 230 Technology Policy & Regulation	S		**P**			S		S
TSI 240 Innovation Strategy	S			**P**		S		
TSI 220 Design and Prototyping for Technology Leaders		**P**	S			S		
TSI 250 Leadership & Team Dynamics						**P**	**P**	
TSI 310 Advanced Sociotechnical Analysis	**P**		S					**P**
TSI 311 Building Intelligent Systems			S		**P**			S
TSI 330 AI Governance & Regulation	S		**P**			S		S
TSI 340 Digital Transformation Strategy	S			**P**		S	S	
TSI 350 Applied Leadership Practicum				S		S	**P**	
TSI 395 Internship	S	S	S	S	S	S	S	S
TSI 410 Technology Futures and Foresight	**P**		S			S		**P**
TSI 491 Capstone I	**P**	**P**	S	**P**	**P**	**P**	**P**	S
TSI 492 Capstone II	**P**	**P**	S	**P**	**P**	**P**	**P**	**P**

Reading the Matrix

- Every PLO has at least four courses with a **P** designation, ensuring multiple opportunities for development and assessment.
- The capstone sequence (TSI 491/492) addresses all eight PLOs, serving as the integrative culmination of the program.

- The internship (TSI 395) provides supporting experience for all PLOs but is not a primary assessment point for any single outcome.
- No course addresses more than four PLOs at the primary level, ensuring focus and depth.

2.1.4 PLO-to-Career Pathway Mapping

Each of the program's target career pathways requires a distinct but overlapping subset of PLOs.

Career Pathway	Critical PLOs	Important PLOs	Supporting PLOs
Product Manager	PLO-2, PLO-4, PLO-7	PLO-1, PLO-5, PLO-6	PLO-3, PLO-8
Technology Strategy Consultant	PLO-1, PLO-4, PLO-6	PLO-2, PLO-7, PLO-8	PLO-3, PLO-5
AI Governance / Responsible AI	PLO-3, PLO-8	PLO-1, PLO-5, PLO-6	PLO-2, PLO-4, PLO-7
UX Researcher / Designer	PLO-2, PLO-6	PLO-1, PLO-5, PLO-7	PLO-3, PLO-4, PLO-8
AI Systems Architect	PLO-1, PLO-5, PLO-8	PLO-2, PLO-3, PLO-6	PLO-4, PLO-7
Digital Transformation Lead	PLO-1, PLO-4, PLO-7	PLO-2, PLO-6, PLO-8	PLO-3, PLO-5
Technology Policy Analyst	PLO-3, PLO-6	PLO-1, PLO-8	PLO-2, PLO-4, PLO-5, PLO-7
Innovation Manager	PLO-4, PLO-7	PLO-1, PLO-2, PLO-6	PLO-3, PLO-5, PLO-8
Venture Capital / Startup Analyst	PLO-4, PLO-8	PLO-1, PLO-5, PLO-6	PLO-2, PLO-3, PLO-7
Chief of Staff (Tech Org)	PLO-6, PLO-7	PLO-1, PLO-4	PLO-2, PLO-3, PLO-5, PLO-8

Key Observations

- **PLO-1 (Sociotechnical Systems)** and **PLO-6 (Communication)** are critical or important for every career pathway. These are the program's foundational differentiators.
- **PLO-3 (Ethics/Governance)** is critical for AI Governance and Policy roles but remains at least supporting for every pathway — reflecting the program's conviction that ethical reasoning is universally necessary.

- **PLO-7 (Leadership)** is critical for all management-track roles and important for consulting, reflecting the program's emphasis on producing leaders, not just analysts.
- Students selecting a concentration can use this matrix to identify which PLOs to strengthen through elective choices.

2.1.5 Assessment Strategy

Assessment Philosophy

The TSI program uses a portfolio-based assessment model that emphasizes authentic performance over standardized testing. Students demonstrate competence by producing real artifacts — systems analyses, design prototypes, policy briefs, business plans, code repositories, presentations, and leadership reflections — that are evaluated against explicit rubrics aligned to PLOs.

Formative Assessment (Years 1-2)

In the first two years, assessment emphasizes learning and growth:

- **Low-stakes, frequent feedback:** Weekly assignments with rapid instructor feedback. Peer review protocols in every project course.
- **Structured reflection:** After each major project, students write reflections connecting their work to PLOs and identifying areas for growth.
- **Portfolio check-ins:** At the end of each semester, students meet with their faculty advisor to review their portfolio progress and plan next steps.
- **Skills diagnostics:** Periodic self-assessments and skills inventories help students identify strengths and gaps.
- **Rubric transparency:** All rubrics are shared with students before assignments begin. Students practice self-assessment using the same rubrics faculty use.

Summative Assessment (Years 3-4)

In the upper years, assessment emphasizes demonstration of professional competence:

- **Portfolio milestones:** At the end of Year 3, students submit a mid-program portfolio with at least one artifact for each PLO. A faculty committee reviews a sample and provides feedback.
- **Capstone evaluation:** The year-long capstone is evaluated by a panel including the faculty advisor, a second faculty reader, and the industry sponsor. Evaluation rubrics map directly to PLOs.
- **External review:** Industry sponsors evaluate capstone deliverables, providing an external validity check on program outcomes.
- **Senior portfolio defense:** In the final semester, students present their complete portfolio to a faculty panel and defend their learning across all eight PLOs.
- **Exit survey and interviews:** Graduating seniors complete a detailed exit survey; a sample participate in structured interviews about their learning experience.

PLO Assessment Schedule

PLO	Formative Assessment Points	Summative Assessment Points
PLO-1	TSI 101 systems map (Y1); TSI 210 case analysis (Y2)	TSI 310 systems evaluation (Y3); Capstone systems component (Y4)
PLO-2	TSI 120 design sprint (Y1); core project courses (Y2)	Design track courses (Y3); Capstone design deliverable (Y4)
PLO-3	TSI 130 ethics analysis (Y1); TSI 230 policy analysis (Y2)	TSI 330 policy brief (Y3); Capstone governance component (Y4)
PLO-4	TSI 140 business model (Y1); TSI 240 strategy analysis (Y2)	TSI 340 transformation strategy (Y3); Capstone strategy component (Y4)
PLO-5	TSI 110 coding projects (Y1); TSI 211 data projects (Y2)	TSI 311 ML project (Y3); Capstone technical component (Y4)
PLO-6	TSI 101 presentations (Y1); TSI 120 design reviews (Y1-2)	TSI 250 leadership presentations (Y2-3); Capstone executive presentations (Y4)
PLO-7	TSI 120 team reflections (Y1); TSI 250 peer assessments (Y2)	Team project 360-feedback (Y3); Capstone team evaluations (Y4)
PLO-8	TSI 101 tech scan (Y1); TSI 210 trend analysis (Y2)	TSI 310 foresight report (Y3); TSI 410 foresight analysis (Y4)

2.1.6 Bloom's Taxonomy Progression: Detailed Explanation

The Deliberate Scaffolding Model

The TSI curriculum is designed so that students encounter each PLO at progressively higher cognitive levels as they advance through the program. This is not accidental — it reflects a deliberate instructional design choice grounded in Bloom's Revised Taxonomy.

Year 1: Foundation (Remember, Understand, Apply)

In the first year, students are building vocabulary, frameworks, and foundational skills. They learn to: - **Remember** key concepts, terminology, and frameworks in each strand - **Understand** relationships between technology, society, organizations, and ethics - **Apply** basic frameworks to structured, well-defined problems

Assessment focus: Can the student correctly identify, describe, and apply foundational concepts?

Example: In TSI 101, a student can describe what a sociotechnical system is, identify its components in a case study, and apply a basic systems mapping framework.

Year 2: Development (Apply, Analyze)

In the second year, students move from applying frameworks to structured problems toward analyzing complex, real-world situations. They learn to: - **Apply** multiple frameworks and tools to increasingly open-ended problems - **Analyze** real-world cases by breaking them into components, identifying patterns, and distinguishing relevant from irrelevant information

Assessment focus: Can the student apply tools appropriately to novel situations and produce structured analyses?

Example: In TSI 240, a student can analyze an existing technology company's business model, identify its strengths and vulnerabilities, and compare it to competitors using appropriate strategic frameworks.

Year 3: Synthesis (Analyze, Evaluate)

In the third year, students confront genuinely ambiguous problems with no single correct answer. They learn to: - **Analyze** complex multi-stakeholder situations with competing values and incomplete information - **Evaluate** competing approaches, making and defending judgments based on criteria they must sometimes define themselves

Assessment focus: Can the student navigate ambiguity, weigh competing considerations, and produce well-reasoned judgments?

Example: In TSI 330, a student can evaluate competing regulatory approaches to AI governance, weighing innovation incentives against harm prevention, and produce a policy brief that defends a specific recommendation while acknowledging trade-offs.

Year 4: Integration (Evaluate, Create)

In the senior year, students operate as junior professionals. They learn to: - **Evaluate** their own and others' work against professional standards - **Create** original solutions, strategies, analyses, and recommendations for real organizations

Assessment focus: Can the student produce professional-quality work that integrates knowledge from all five strands and demonstrates mastery of relevant PLOs?

Example: In the capstone, a student team creates an original solution for an industry sponsor that integrates systems analysis (PLO-1), human-centered design (PLO-2), ethical evaluation (PLO-3), innovation strategy (PLO-4), technical implementation (PLO-5), professional communication (PLO-6), team leadership (PLO-7), and technology foresight (PLO-8).

Visualization of Bloom's Progression

```
                         Year 1    Year 2    Year 3    Year 4
                        --------  --------  --------  --------
Create                                        [    ]  [======]
Evaluate                                [    ] [=====]  [======]
Analyze                          [    ] [=====] [====]  [  ==  ]
Apply                   [    ]  [=====] [====]  [  =  ]
Understand             [=====]  [====]  [  =  ]
Remember               [=====]  [  =  ]

Legend: [======] = primary emphasis   [    ] = introduced   [  =  ] = maintained
```

This progression ensures that students are not asked to evaluate or create before they have the foundational knowledge and analytical skills to do so effectively. It also ensures that by graduation, every student has had extensive practice at the highest cognitive levels.

2.1.7 Continuous Improvement of Learning Outcomes

The PLOs are reviewed annually as part of the program's continuous improvement cycle:

1. **Data collection:** Portfolio reviews, capstone evaluations, student surveys, employer feedback, and alumni surveys provide evidence of PLO achievement.
2. **Analysis:** The Curriculum Committee analyzes assessment data to identify PLOs where student performance is below expectations.
3. **Action:** The committee recommends curricular adjustments — new assignments, revised rubrics, additional scaffolding, resequenced content — to address identified gaps.
4. **Implementation:** Faculty implement changes in the following academic year.
5. **Re-assessment:** The impact of changes is evaluated in the next assessment cycle.

PLO language and scope may be revised on a 3-5 year cycle based on evolving industry needs, student outcomes data, and feedback from the Industry Advisory Board. Any changes to PLOs trigger a review of the PLO-to-course mapping matrix and assessment schedule.

2.2 Degree Structure

2.2.1 Credit Distribution

The B.S. in TSI requires 124 credit hours distributed as follows:

Category	Credits	% of Total	Courses
TSI Core	54	43.5%	18 courses at 3 cr each
Concentration	15	12.1%	5 courses at 3 cr each
Technical Depth Electives	6	4.8%	2 courses at 3 cr each
Exploratory Electives	9	7.3%	3 courses at 3 cr each
General Education	28	22.6%	9 courses (see breakdown)
Experiential Learning	12	9.7%	Internship (3 cr) + Capstone (9 cr)
Total	**124**	**100%**	

2.2.2 The Five Thematic Strands

The 18-course TSI core is organized into five thematic strands that provide vertical coherence from first year through senior year. Each strand has its own internal progression, and all strands converge in the capstone.

Strand A: Sociotechnical Foundations

Purpose: Develop systems thinking and the ability to analyze the complex interplay between technology, people, organizations, and policy.

Sequence	Course	Credits	Year	Semester
A1	TSI 101 — Introduction to Sociotechnical Systems	3	1	Fall
A2	TSI 210 — Technology and Organizational Change	3	2	Fall
A3	TSI 310 — Complex Adaptive Systems	3	3	Fall
A4	TSI 410 — Technology Futures and Foresight	3	4	Fall

Progression: From foundational systems vocabulary (101) to organizational analysis of technology adoption and change (210) to complexity theory, agent-based modeling, and emergence (310) to strategic foresight and scenario planning for emerging technologies (410).

Strand B: Technical Fluency

Purpose: Build computational and data skills from zero to proficiency in programming, data science, and AI systems design — with an emphasis on working alongside AI tools and designing AI-native solutions, not just building models from scratch.

Sequence	Course	Credits	Year	Semester
B1	TSI 110 — Computational Thinking and Programming	3	1	Fall
B2	TSI 212 — AI and Machine Learning Foundations	3	2	Fall
B3	TSI 211 — Data Science for Decision Making	3	2	Spring
B4	TSI 311 — Building Intelligent Systems	3	3	Spring

Progression: From Python fundamentals and AI-augmented development assuming no prior experience (110) to understanding how AI systems work and developing judgment about their capabilities and limitations (212) to full data-science workflows, visualization, and data storytelling (211) to designing, orchestrating, and evaluating AI-native systems including agentic architectures and multi-component AI applications (311).

Strand C: Ethics, Policy, and Governance

Purpose: Develop the ability to reason ethically about technology, analyze policy, and contribute to governance of emerging technologies.

Sequence	Course	Credits	Year	Semester
C1	TSI 130 — Ethics of Technology	3	1	Spring
C2	TSI 230 — Technology Policy and Regulation	3	2	Spring
C3	TSI 330 — AI Governance and Responsible Innovation	3	3	Fall

Progression: From foundational ethical frameworks applied to technology cases (130) to analysis of existing regulatory regimes and policy design (230) to specialized study of AI governance, algorithmic accountability, and international coordination (330).

Note: The ethics/governance thread continues into Year 4 through the AI Governance concentration courses and is reinforced in the capstone, where all projects include ethical and governance considerations.

Strand D: Innovation and Strategy

Purpose: Develop business acumen, strategic thinking, and the ability to lead innovation and organizational transformation.

Sequence	Course	Credits	Year	Semester
D1	TSI 140 — Business Fundamentals for Technologists	3	1	Spring
D2	TSI 240 — Innovation and Entrepreneurship	3	2	Fall
D3	TSI 340 — Technology Strategy and Business Models	3	3	Spring

Progression: From foundational business concepts and the technology value chain (140) to innovation strategy, lean methodology, and venture building (240) to platform strategy, digital transformation, and competitive positioning (340).

Strand E: Design and Leadership

Purpose: Develop human-centered design skills and leadership capabilities through a four-course sequence spanning three years.

Sequence	Course	Credits	Year	Semester
E1	TSI 120 — Human-Centered Design Thinking	3	1	Spring

Sequence	Course	Credits	Year	Semester
E2	TSI 220 — Design and Prototyping for Technology Leaders	3	2	Fall
E3	TSI 250 — Leadership in Technical Organizations	3	2	Spring
E4	TSI 350 — Applied Leadership Practicum	3	3	Spring

Progression: From design foundations and human-centered methods (120) to intermediate prototyping and design leadership skills (220) to leadership theory and interpersonal effectiveness in technical organizations (250) to an applied practicum integrating design and leadership through a real-world team engagement (350). Design and leadership skills are further reinforced in every project-based course and in the capstone sequence. Students seeking additional design or leadership depth can pursue the Human-Centered Technology Design or Technology Strategy and Entrepreneurship concentration tracks.

Core Course Summary (18 courses, 54 credits)

#	Course	Cr	Strand	Year	Sem
1	TSI 101 — Introduction to Sociotechnical Systems	3	A	1	F
2	TSI 110 — Computational Thinking and Programming	3	B	1	F
3	TSI 120 — Human-Centered Design Thinking	3	E	1	Sp
4	TSI 130 — Ethics of Technology	3	C	1	Sp
5	TSI 140 — Business Fundamentals for Technologists	3	D	1	Sp
6	TSI 210 — Technology and Organizational Change	3	A	2	F
7	TSI 212 — AI and Machine Learning Foundations	3	B	2	F
8	TSI 220 — Design and Prototyping for Technology Leaders	3	E	2	F
9	TSI 240 — Innovation and Entrepreneurship	3	D	2	F
10	TSI 211 — Data Science for Decision Making	3	B	2	Sp
11	TSI 230 — Technology Policy and Regulation	3	C	2	Sp
12	TSI 250 — Leadership in Technical Organizations	3	E	2	Sp
13	TSI 310 — Complex Adaptive Systems	3	A	3	F
14	TSI 330 — AI Governance and Responsible Innovation	3	C	3	F

#	Course	Cr	Strand	Year	Sem
15	TSI 311 — Building Intelligent Systems	3	B	3	Sp
16	TSI 340 — Technology Strategy and Business Models	3	D	3	Sp
17	TSI 350 — Applied Leadership Practicum	3	E	3	Sp
18	TSI 410 — Technology Futures and Foresight	3	A	4	F

Note: The 18 core courses above total 54 credits. TSI 395 (internship, 3 cr), TSI 491 (capstone I, 3 cr), and TSI 492 (capstone II, 6 cr) are accounted for in the experiential learning category (12 credits). Together with concentration courses (15 cr), technical depth electives (6 cr), general education (28 cr), and exploratory electives (9 cr), the program totals 124 credits as shown in the sample plan below.

2.2.3 General Education Requirements (28 credits)

TSI students complete the university's general education requirements, which provide breadth across the liberal arts and sciences. Specific requirements and recommended courses:

Requirement	Credits	Notes
First-Year Writing	3	University writing seminar (Fall or Spring, Year 1)
Quantitative Reasoning	3	STAT 201 Introductory Statistics required; MATH 151 Calculus I (or equivalent) is also required and counts as one Technical Depth Elective
Natural/Physical Science with Lab	7	Two courses: one lecture (3 cr) + one lecture with lab (4 cr); Environmental Science or Cognitive Science recommended for TSI alignment
Social & Behavioral Sciences	6	Two courses; Principles of Economics (Micro or Macro) strongly recommended as one; Psychology or Sociology as the other
Humanities & Arts	6	Two courses; Philosophy of Science, History of Technology, or Ethics (if not overlapping with TSI 130 content) recommended
Diversity & Global Perspectives	3	One course; can often double-count with Social & Behavioral Sciences or Humanities if approved
Total	**28**	Some double-counting possible with advisor approval per university policy

Advising note: General education courses are distributed across all four years but are concentrated in Years 1-2 to free upper-division semesters for concentration courses, technical depth electives, and the capstone. The sample 4-year plan below shows a recommended distribution.

Gen Ed Cross-Listing Potential

Several TSI core courses are designed to meet the learning objectives of standard gen ed categories and should be proposed for cross-listing at the home institution. This follows the practice of peer interdisciplinary programs (e.g., Carnegie Mellon allows unlimited double-counting between gen ed and interdisciplinary major courses).

TSI Course	Potential Gen Ed Category	Rationale
TSI 101 Introduction to Sociotechnical Systems	Social Sciences; or First-Year Seminar	Introduces social science analytical frameworks applied to technology and society
TSI 130 Ethics of Technology	Humanities (Philosophy/Ethics)	Covers major ethical frameworks with rigorous philosophical engagement
TSI 140 Business Fundamentals for Technologists	Social Sciences	Covers organizational behavior, economics of markets, and decision-making
TSI 210 Technology and Organizational Change	Social Sciences	Applies organizational theory and change management frameworks
TSI 211 Data Science for Decision Making	Quantitative Reasoning	Statistical inference, hypothesis testing, data-driven reasoning
TSI 230 Technology Policy and Regulation	Social Sciences; or Writing Intensive	Policy analysis, regulatory frameworks, and extensive analytical writing
TSI 310 Complex Adaptive Systems	Natural Science (at some institutions)	Network science, complexity theory, computational modeling
TSI 410 Technology Futures and Foresight	Upper-Division Writing Intensive	5,000-word foresight report; extensive analytical writing

If an institution approves 2-3 of these cross-listings, students gain 6-9 credits of flexibility — enough to accommodate foreign language requirements, additional science courses, or institution-specific mandates without extending time to degree.

Institutional Variability

Gen ed requirements vary significantly across universities. The TSI program is designed with 28 dedicated gen ed credits plus the expectation that institutional cross-listing will provide additional flexibility. The following table shows how the program adapts to common institutional requirements beyond the standard distribution:

Institutional Requirement	How TSI Accommodates
Foreign language (6-8 cr)	Use exploratory electives (9 cr) for a two-semester language sequence; or satisfy via high school AP/IB credit or placement exam at many institutions
US History/Government (3-6 cr, required at many state universities)	Use one Social/Behavioral Science gen ed slot; or use an exploratory elective
Physical education/wellness (1-3 cr)	Typically satisfied outside credit requirements (many universities don't count PE toward degree credits) or absorbed by a slight credit overload in one semester
First-year seminar (1-3 cr)	Propose TSI 101 for cross-listing as first-year seminar; or satisfy with a 1-credit orientation course in addition to the 124-credit plan
Upper-division writing intensive (0-3 cr)	Designate TSI 230, TSI 340, or TSI 410 as writing intensive (all require substantial analytical writing); no additional courses needed
Additional science (3-4 cr)	Use one technical depth elective for a science course; or gain flexibility through gen ed cross-listing of TSI courses

For program planners at specific institutions: Before launch, conduct a credit-by-credit audit mapping TSI's 124 credits to the institution's specific degree requirements. Identify which TSI courses to propose for gen ed cross-listing and where exploratory electives need to absorb institutional mandates. This audit should be completed during the pre-launch phase (see 11-implementation.md).

2.2.4 Concentration Tracks (15 credits each)

Students declare a concentration by the end of Year 2 (typically during spring semester advising). Each concentration consists of five courses (15 credits), with at least three at the 300+ level. Concentrations provide depth in a specific area while preserving the breadth of the integrative core.

Track 1: AI Governance and Policy

Focus: Designing, implementing, and evaluating governance mechanisms for AI and other emerging technologies. Bridges technical understanding and regulatory/organizational governance.

Ideal for students pursuing: AI Ethics Officer, AI Policy Analyst, Responsible AI Manager, Governance Translator, Regulatory Affairs, AI Auditor, Chief AI Officer pathways.

Course	Credits	Semester	Level
TSI 331 — Algorithmic Auditing and Accountability	3	Year 3 Fall	300
TSI 332 — Data Governance and Privacy Engineering	3	Year 3 Fall	300

Course	Credits	Semester	Level
TSI 431 — AI Safety and Alignment	3	Year 3 Spring	400
TSI 432 — Comparative Technology Governance	3	Year 4 Fall	400
TSI 433 — Practicum in AI Governance	3	Year 4 Spring	400

Track 2: Product and Innovation Management

Focus: The full product management toolkit: discovery, strategy, execution, and growth. Bridges user research, technical understanding, business strategy, and data-driven decision making.

Ideal for students pursuing: Product Manager, Product Strategist, Innovation Manager, Technical Program Manager, Growth Strategist, Venture Capital Analyst pathways.

Course	Credits	Semester	Level
TSI 341 — Product Management Fundamentals	3	Year 3 Fall	300
TSI 342 — User Research and Analytics	3	Year 3 Fall	300
TSI 441 — Advanced Product Strategy	3	Year 3 Spring	400
TSI 442 — Growth, Metrics, and Experimentation	3	Year 4 Fall	400
TSI 443 — Product Studio	3	Year 4 Spring	400

Track 3: Human-Centered Technology Design

Focus: Advanced design skills encompassing interaction design, inclusive design, service design, systems design, and design research.

Ideal for students pursuing: UX Researcher, UX/UI Designer, Service Designer, Design Strategist, Accessibility Specialist, Design Manager pathways.

Course	Credits	Semester	Level
TSI 321 — Interaction Design and Prototyping	3	Year 3 Fall	300
TSI 322 — Inclusive and Accessible Design	3	Year 3 Fall	300
TSI 421 — Design Research Methods	3	Year 3 Spring	400
TSI 422 — Service and Systems Design	3	Year 4 Fall	400
TSI 423 — Design Studio	3	Year 4 Spring	400

Track 4: Technology Strategy and Entrepreneurship

Focus: Strategic thinking and execution skills for leading technology-driven organizations and ventures. Combines analytical rigor with entrepreneurial action.

Ideal for students pursuing: Strategy Consultant, Corporate Strategist, Startup Founder, Business Development Manager, Technology Investment Analyst, Digital Transformation Leader pathways.

Course	Credits	Semester	Level
TSI 343 — Venture Creation and Startup Finance	3	Year 3 Fall	300
TSI 344 — Digital Transformation Management	3	Year 3 Fall	300
TSI 444 — Technology M&A and Investment	3	Year 3 Spring	400
TSI 445 — Scaling Technology Ventures	3	Year 4 Fall	400
TSI 446 — Strategy Practicum	3	Year 4 Spring	400

Cross-Track Notes

- Students may take individual courses from other tracks as exploratory electives to broaden their skills.
- Students may petition the TSI Curriculum Committee for a self-designed concentration with a minimum of five courses (15 credits), a coherent rationale, and at least three courses at the 300+ level.
- A second concentration can be completed using exploratory elective credits plus additional credits (typically taken as an overload or summer course), depending on overlap.

2.2.5 Technical Depth Electives (6 credits)

Students take two courses (6 credits) from engineering, computer science, data science, or related technical departments. At least one course must be at the 300-level or above. Note that MATH 151 Calculus I (or equivalent) is required for all TSI students and counts as one of the two technical depth electives for students who did not place out of calculus. Students who place out of calculus take two additional technical electives of their choice.

Purpose: These electives allow students to deepen their technical skills beyond the TSI core. The specific courses depend on the student's concentration and career goals.

Example approved courses:

Department	Sample Courses
Computer Science	Data Structures, Databases, Software Engineering, Computer Networks
Data Science	Statistical Learning, Data Mining, Big Data Systems
Electrical/Computer Engineering	Signals & Systems, Embedded Systems, IoT
Industrial Engineering	Operations Research, Human Factors Engineering
Information Science	Information Retrieval, Knowledge Management

Advising guidance by concentration (one slot may be filled by MATH 151 Calculus I if not already completed):

- **AI Governance and Policy:** Cybersecurity Fundamentals, Database Systems
- **Product and Innovation Management:** Database Systems, Cloud Computing
- **Human-Centered Technology Design:** Cognitive Science/Psychology of Perception, Front-End Web Development
- **Technology Strategy and Entrepreneurship:** Cloud Computing/Distributed Systems, Financial Engineering/Quantitative Methods

2.2.6 Exploratory Electives (9 credits, 3 courses)

Three courses chosen by the student from anywhere in the university catalog. While these can be used for any purpose (a minor, additional technical depth, a second concentration), TSI encourages students to use at least one exploratory elective to stretch beyond the core curriculum — to encounter ideas, disciplines, and ways of thinking that challenge and expand their perspective.

Why this matters: The most effective technology leaders draw on a breadth of human understanding that goes beyond technical, business, and policy skills. History teaches pattern recognition. Philosophy sharpens reasoning. Literature builds empathy. Art cultivates creative vision. Science illuminates the natural world that technology interacts with. The best TSI graduates will be those who bring unexpected intellectual depth to their work.

Recommended Exploratory Categories:

Category	Example Courses	Why It Matters for TSI Students
Creative Expression	Creative writing, visual arts, music, theater, filmmaking	Builds creative confidence, communication range, and the ability to see problems from non-analytical perspectives

Category	Example Courses	Why It Matters for TSI Students
Deep Humanities	Philosophy of mind, history of science and technology, political philosophy, literary theory	Provides the intellectual foundations that make ethical reasoning, policy analysis, and foresight more sophisticated
Global and Cultural Perspectives	Anthropology, area studies, comparative religion, foreign language	Develops cultural fluency essential for designing technology that works across diverse contexts
Scientific Depth	Cognitive science, ecology, neuroscience, physics, biology	Deepens understanding of the natural and cognitive systems that technology interacts with
Speculative and Imaginative	Science fiction literature, speculative design, futures studies seminars, philosophy of technology	Expands imagination about what technology could be, not just what it is — directly complementing the foresight strand

Students are free to choose any combination. Common practical uses include: completing a minor (many minors require 15-18 credits; combine with technical depth electives), taking a foreign language sequence (if required by the university or desired for career reasons), or exploring a passion area.

2.2.7 Experiential Learning (12 credits)

TSI 395: Professional Internship (3 credits)

Timing: Summer between Year 3 and Year 4

Requirements: - Minimum 10 weeks, full-time (400+ hours) - Position must involve work at the intersection of technology and one or more of: strategy, design, policy, ethics, or organizational change - Students submit a learning plan (pre-internship), weekly reflections, and a final internship report connecting their experience to PLOs - Faculty advisor provides midpoint check-in and reviews final report

Placement support: The TSI Program Office maintains relationships with 50+ partner organizations spanning technology companies, consulting firms, policy organizations, startups, nonprofits, and government agencies. Students may also identify their own placements with advisor approval.

TSI 491: Capstone I (3 credits)

Timing: Year 4, Fall semester

Structure: - Student teams of 4-5 are matched with industry sponsors who present real organizational challenges at the intersection of technology and society - Fall semester focuses on problem definition, stakeholder analysis, research, and preliminary design - Deliverables: Project charter, stakeholder map, literature review, preliminary systems analysis, initial design concepts, and midterm presentation to sponsor

TSI 492: Capstone II (6 credits)

Timing: Year 4, Spring semester

Structure: - Teams continue with their sponsor project, moving from analysis and design to prototyping, testing, strategy development, and implementation planning - Higher credit weight reflects the intensity of the spring semester: building and testing solutions, preparing final deliverables, and presenting at the public capstone showcase - Deliverables: Functional prototype or detailed specification, business/strategy plan, policy/governance analysis, implementation roadmap, final report, executive presentation, and public showcase presentation

Why year-long: A two-semester capstone allows teams to build genuine relationships with sponsors, iterate meaningfully on their solutions, and produce work of professional quality. One-semester capstones typically result in surface-level analyses; the year-long format enables the depth that distinguishes TSI graduates.

2.2.8 Complete Prerequisite Map

The following diagram shows the prerequisite relationships among all TSI core courses, the capstone sequence, and the internship. Arrows indicate prerequisites (the arrow points from prerequisite to dependent course).

```
YEAR 1 FALL                    YEAR 1 SPRING
-----------                    -------------
TSI 101 ----+----------------> TSI 120 (Human-Centered
(Sociotech   |                  Design Thinking)
 Systems)    |                  prereq: 101
             |
             +----------------> TSI 130 (Ethics of
             |                  Technology)
             |                  prereq: 101
             |
TSI 110 ----+                -> TSI 140 (Business
(Comp Think) |                  Fundamentals)
             |                  prereq: None
             |
             |
YEAR 2 FALL  |                 YEAR 2 SPRING
-----------  |                 -------------
             |
TSI 210 <----+-- (101 + 140)  TSI 211 <-- (110, MATH/STAT)
(Org Change) |                 (Data Science for
             |                  Decision Making)
TSI 212 <----+-- (110,
(AI & ML        MATH/STAT)     TSI 230 <-- (130)
 Foundations)                   (Tech Policy &
                                Regulation)
TSI 220 <-- (120)
(Design &                      TSI 250 <-- (120)
 Prototyping)                  (Leadership in
                                Technical Orgs)
TSI 240 <-- (140)
(Innovation &
```

```
 Entrepreneurship)

YEAR 3 FALL                      YEAR 3 SPRING
-----------                      -------------

TSI 310 <-- (210)                TSI 311 <-- (212 + 211)
(Complex                         (Building Intelligent
 Adaptive Sys)                    Systems)

TSI 330 <-- (230 + 212)          TSI 340 <-- (240)
(AI Governance &                 (Technology Strategy &
 Resp. Innovation)                Business Models)

                                 TSI 350 <-- (250)
                                 (Applied Leadership
                                  Practicum)

SUMMER (between Year 3 and Year 4)
------------------------------------
TSI 395 --- Professional Internship
prereq: completion of Year 2 core + advisor approval

YEAR 4 FALL                      YEAR 4 SPRING
-----------                      -------------

TSI 410 <-- (310)                Concentration Courses 4-5
(Technology                      (Year 4 Fall + Spring)
 Futures)

TSI 491 <-- (Senior standing)    TSI 492 <-- (491)
(Capstone I)                     (Capstone II)
prereq: all core
 through Year 3
```

Prerequisite Summary Table

Course	Prerequisites
TSI 101	None
TSI 110	None
TSI 120	TSI 101
TSI 130	TSI 101
TSI 140	None
TSI 210	TSI 101, TSI 140
TSI 212	TSI 110, MATH/STAT

Course	Prerequisites
TSI 220	TSI 120
TSI 240	TSI 140
TSI 211	TSI 110, MATH/STAT
TSI 230	TSI 130
TSI 250	TSI 120
TSI 310	TSI 210
TSI 330	TSI 230, TSI 212
TSI 311	TSI 212, TSI 211
TSI 340	TSI 240
TSI 350	TSI 250
TSI 395	Completion of all Year 2 core courses + advisor approval
TSI 410	TSI 310
TSI 491	Senior standing; all core through Year 3
TSI 492	TSI 491

2.2.9 Sample 4-Year Plan

The following plan shows one recommended path through the degree. Actual plans will vary based on general education course availability, concentration choice, and individual circumstances.

Year 1

Fall Semester (16 cr)	Spring Semester (15 cr)
TSI 101 — Introduction to Sociotechnical Systems (3)	TSI 120 — Human-Centered Design Thinking (3)
TSI 110 — Computational Thinking and Programming (3)	TSI 130 — Ethics of Technology (3)
STAT 201 — Introductory Statistics (3)	TSI 140 — Business Fundamentals for Technologists (3)

Fall Semester (16 cr)	Spring Semester (15 cr)
Gen Ed: First-Year Writing (3)	Gen Ed: Humanities & Arts (3)
Gen Ed: Natural/Physical Science with Lab (4)	Gen Ed: Natural/Physical Science (3)
Semester: 16 cr	*Semester: 15 cr*

Year 1 Total: 31 credits

Year 2

Fall Semester (15 cr)	Spring Semester (15 cr)
TSI 210 — Technology and Organizational Change (3)	TSI 211 — Data Science for Decision Making (3)
TSI 212 — AI and Machine Learning Foundations (3)	TSI 230 — Technology Policy and Regulation (3)
TSI 220 — Design and Prototyping for Technology Leaders (3)	TSI 250 — Leadership in Technical Organizations (3)
TSI 240 — Innovation and Entrepreneurship (3)	Gen Ed: Social & Behavioral Science (3)
Gen Ed: Social & Behavioral Science (3)	Exploratory Elective I (3)
Semester: 15 cr	*Semester: 15 cr*

Year 2 Total: 30 credits

Concentration declared by the end of Year 2 (spring advising period)

Year 3

Fall Semester (15 cr)	Spring Semester (15 cr)
TSI 310 — Complex Adaptive Systems (3)	TSI 311 — Building Intelligent Systems (3)
TSI 330 — AI Governance and Responsible Innovation (3)	TSI 340 — Technology Strategy and Business Models (3)
Concentration Course 1 (3)	TSI 350 — Applied Leadership Practicum (3)
Concentration Course 2 (3)	Concentration Course 3 (3)
Technical Depth Elective I (3)	Exploratory Elective II (3)
Semester: 15 cr	*Semester: 15 cr*

Summer

Summer (3 cr)
TSI 395 — Professional Internship (3)

Year 3 Total: 33 credits (including summer)

Year 4

Fall Semester (15 cr)	Spring Semester (15 cr)
TSI 410 — Technology Futures and Foresight (3)	TSI 492 — Capstone II (6)
TSI 491 — Capstone I (3)	Concentration Course 5 (3)
Concentration Course 4 (3)	Gen Ed: Humanities & Arts (3)
Technical Depth Elective II (3)	Gen Ed: Diversity & Global Perspectives (3)
Exploratory Elective III (3)	
Semester: 15 cr	*Semester: 15 cr*

Year 4 Total: 30 credits

Degree Total

Category	Credits
Year 1	31
Year 2	30
Year 3 (incl. summer)	33
Year 4	30
Grand Total	**124**

Semester Load Analysis

Semester	Credits	Notes
Y1 Fall	16	Manageable introductory load
Y1 Spring	15	Standard load
Y2 Fall	15	Four core courses + gen ed
Y2 Spring	15	Standard load
Y3 Fall	15	Advanced core + concentration courses
Y3 Spring	15	Three core courses + concentration + elective
Summer	3	Internship only
Y4 Fall	15	Standard load; capstone begins
Y4 Spring	15	Capstone-intensive (6 cr capstone is high workload despite balanced credit count)

2.2.10 Design Rationale

Why 124 Credits (Not 120 or 128)

The 124-credit requirement reflects a deliberate balance. The standard minimum at many universities is 120 credits, but the integrative breadth of TSI — spanning technical, design, business, ethics, and leadership domains — requires more curricular space than a traditional single-discipline degree. However, we intentionally stayed below 128 credits (a common engineering threshold) because TSI is not an engineering degree and should not impose an engineering-level credit burden. The 124-credit total allows a robust 54-credit core, a meaningful 15-credit concentration, general education, and sufficient elective space for minors and exploration — all within a feasible 4-year timeline with semester loads averaging 15-16 credits.

Why 54 Credits of Core

The 54-credit core (43.5% of the degree) is the largest single component because integration is the program's fundamental value proposition. TSI graduates are distinguished not by depth in any single domain but by their ability to connect technical, ethical, strategic, design, and leadership perspectives. This integration requires sustained, structured engagement with all five thematic strands across multiple years. The expansion from the original 48-credit (16-course) design to 54 credits (18 courses) was driven by reviewer feedback that Strand E (Design and Leadership) was underrepresented with only two courses compared to three or four in other strands. Adding TSI 220 (Design and Prototyping) and TSI 350 (Applied Leadership Practicum) brings Strand E to four courses, matching the depth of the other strands and ensuring that design and leadership receive the same sustained curricular attention as systems thinking, technical fluency, ethics, and strategy. The 54-credit core is comparable to other interdisciplinary programs (e.g., Stanford Symbolic Systems requires approximately 50 credits of core/required courses).

Why 4 Concentrations

Four concentrations (AI Governance and Policy, Product and Innovation Management, Human-Centered Technology Design, Technology Strategy and Entrepreneurship) were selected based on three criteria:

1. **Labor market demand:** Each concentration maps to career pathways with strong and growing demand, as validated by the Industry Advisory Board and labor market analysis.
2. **Faculty expertise:** Each concentration can be staffed by existing or readily recruitable faculty with appropriate disciplinary backgrounds.
3. **Distinctiveness:** The four concentrations are sufficiently different from each other to offer genuine choice, but each builds naturally on the TSI core.

Fewer than four concentrations would limit student choice and career pathway diversity. More than four would dilute resources and create scheduling challenges in the program's early years. The self-designed concentration option provides a release valve for students whose interests do not align with the four standard tracks.

Why No Deep Engineering Track

TSI deliberately does not offer a concentration that replicates a traditional engineering or computer science major. This is a principled design choice, not a limitation:

- **Mission alignment:** TSI's mission is to produce integrative leaders, not disciplinary specialists. A deep engineering track would signal that technical depth is the program's real purpose, with other strands as supplements.
- **Competitive positioning:** Students who want to be software engineers or systems engineers are better served by CS or engineering majors. TSI exists for students who want to lead at the intersection — offering an engineering track would blur this positioning.
- **Technical depth electives:** Students who want more technical coursework can take up to 6 credits of technical depth electives plus use exploratory elective slots for additional technical courses, effectively creating 15+ credits of technical coursework beyond the core.
- **Graduate pathways:** TSI graduates pursuing technical graduate programs (e.g., MS in CS, MS in Data Science) will need to supplement with prerequisite courses, which is expected and clearly communicated during advising.

Why Year-Long Capstone

The year-long capstone (TSI 491 + TSI 492, 9 credits total) is one of the program's most distinctive features. The rationale:

- **Depth of engagement:** Real organizational challenges at the intersection of technology and society cannot be meaningfully addressed in 14 weeks. A year-long engagement allows teams to build genuine understanding of the sponsor's context, iterate on solutions, and produce professional-quality deliverables.

- **Relationship building:** Longer engagements allow students to develop real professional relationships with sponsors, often leading to job offers or strong references.
- **Integration:** The capstone is where students demonstrate integration across all five strands and all eight PLOs. This integration requires time — time to conduct systems analysis, design solutions, evaluate ethics, develop strategy, build prototypes, communicate findings, and lead a team.
- **Portfolio impact:** The capstone deliverable is the centerpiece of the professional portfolio. A year-long project produces a substantially more impressive artifact than a one-semester sprint.
- **Industry validation:** The Industry Advisory Board unanimously endorsed the year-long format, noting that the most impactful university partnerships they have experienced involved sustained engagement.

Why Integrated Ethics from Year 1

Ethics is introduced in the first year (TSI 130, Spring) and continues through Years 2 and 3 (TSI 230, TSI 330), with ethical reasoning woven into technical, design, and strategy courses throughout all four years and reinforced in the capstone. This design reflects several convictions:

- **Habits of mind:** Ethical reasoning is a practice that must be developed over time, not a body of knowledge that can be transmitted in a single course. Starting in Year 1 establishes ethical questioning as a habitual part of how TSI students engage with technology.
- **Technical integration:** When ethics is taught only after technical skills are established, students learn to treat ethics as a constraint imposed after the fact rather than a dimension of good design and engineering. Integrating ethics from Year 1 ensures students learn to think technically and ethically simultaneously.
- **Scaffolding:** The four-course ethics/governance sequence allows for genuine cognitive progression — from foundational frameworks (Year 1) to policy analysis (Year 2) to specialized AI governance (Year 3) to original foresight and governance recommendations (Year 4). A single ethics course cannot achieve this depth.
- **Market signal:** Employers increasingly demand technology professionals who can navigate ethical complexity. A program with ethics integrated from Year 1 through Year 4 sends a powerful signal to employers, graduate schools, and accreditors about the seriousness of this commitment.
- **Competitive differentiation:** Most peer programs either lack ethics coursework entirely, relegate it to a single elective, or introduce it late in the curriculum. TSI's integrated ethics strand is a meaningful differentiator.

2.2.11 Curricular Flexibility and Advising

Transfer Students

Transfer students are evaluated individually. Those with strong technical backgrounds (e.g., transferring from a CS program) may place out of TSI 110 and potentially TSI 212, using those freed credits for additional concentration or elective courses. Those with business backgrounds may place out of TSI 140. All transfer students must complete the full ethics/governance strand (TSI 130, 230, 330) and the full sociotechnical strand (TSI 101, 210, 310, 410).

Transfer Pathway and Late Entry: - TSI 101 is offered in summer sessions to accommodate late entrants and transfer students who did not take it during the regular academic year. - Students can enter the TSI program as late as the start of Year 2 if they complete TSI 101 and TSI 110 during the preceding summer session. - General education and exploratory elective credits transfer normally according to university transfer credit policies. - Core TSI courses generally cannot be transferred from other institutions and must be taken within the program, with the exception of TSI 110 (which may be satisfied by an equivalent introductory programming course) and TSI 140 (which may be satisfied by an equivalent business fundamentals course). - The TSI Program Office is developing formal articulation agreements with feeder community colleges and partner institutions to streamline the transfer process and ensure students have a clear pathway into the program.

Double Majors and Minors

TSI's 9 credits of exploratory electives and the potential for general education overlap make it feasible (though demanding) to double-major with CS, Business, or Public Policy. More commonly, students pursue a minor using exploratory electives plus strategic course selection.

Study Abroad

Study abroad is encouraged but requires careful planning given the sequential nature of the TSI core. The recommended windows are:

- **Year 2 Spring** (most flexible): Fewer core-specific prerequisites are needed for subsequent courses. Students can take TSI 211, TSI 230, and TSI 250 at approved partner institutions, or take gen ed and exploratory elective courses abroad and defer those TSI courses.
- **Summer between Year 2 and Year 3** (recommended): A summer study abroad program does not disrupt the academic year sequence and can count toward exploratory elective or gen ed credits.
- **Year 3 Spring** (advanced option): Students may study at a partner institution that offers approved equivalents of TSI 311, TSI 340, and TSI 350. This requires advance approval from the TSI Curriculum Committee and the student's concentration advisor.

Students should plan to complete all Year 2 Fall core courses (TSI 210, TSI 212, TSI 220, TSI 240) before any study abroad period. The TSI Program Office maintains a list of approved partner institutions with pre-evaluated course equivalencies.

Honors Track

An honors designation is available for students who maintain a 3.5+ GPA, complete a thesis-quality capstone with a research component, and present at a scholarly conference or equivalent venue. Honors students enroll in TSI 493 (Honors Capstone Extension, 3 cr) in place of one exploratory elective.

3 Year-by-Year Curriculum

3.1 Year 1: Seeing the World as Systems

3.1.1 Theme and Pedagogical Framework

Year 1 builds a shared vocabulary and foundational technical skills while training students to see technology as deeply embedded in social, ethical, and economic contexts. By the end of this year, students will be able to identify the components of sociotechnical systems, write basic programs, apply ethical reasoning to technology decisions, and articulate how business forces shape innovation. The year operates primarily at the Remember, Understand, and Apply levels of Bloom's taxonomy, establishing the conceptual bedrock upon which all subsequent years build.

Every student enters the TSI program from a different starting point. Year 1 is designed to level-set: humanities-oriented students gain comfort with code and quantitative reasoning, while technically oriented students develop fluency in ethics, design thinking, and organizational dynamics. The cohort model ensures that students form lasting peer relationships from day one.

3.1.2 Fall Semester (16 credits)

Course	Credits	Type	Strand	Prerequisites
TSI 101 Introduction to Sociotechnical Systems	3	Core	A – Systems & Society	None
TSI 110 Computational Thinking and Programming	3	Core	B – Technical Fluency	None
STAT 201 Introductory Statistics	3	Gen Ed (Quantitative)	–	None
First-Year Writing Seminar	3	Gen Ed	–	None
Science Elective I (with lab)	4	Gen Ed	–	Varies

TSI 101 – Introduction to Sociotechnical Systems (3 credits)

This gateway course establishes the intellectual identity of the TSI program. Students learn to see technologies not as isolated artifacts but as components of larger systems that include people, organizations, policies, and markets. The course surveys landmark cases – from the development of the internet to the deployment of algorithmic decision-making in criminal justice – to illustrate how technical choices produce social consequences and how social forces shape technical design. Lectures introduce systems thinking, actor-network theory, and the social construction of technology (SCOT) framework. Weekly discussion sections require students to apply these frameworks to current events. Assignments include stakeholder mapping exercises, short analytical essays, and a collaborative wiki project that documents a local technology ecosystem. By semester's end, students can decompose a technology into its technical and social subsystems, identify feedback loops and unintended consequences, and communicate their analysis clearly in writing and speech. TSI 101 is the prerequisite for nearly every subsequent TSI course and anchors the Systems and Society strand.

TSI 110 – Computational Thinking and Programming (3 credits)

This course teaches students to think algorithmically and to express that thinking in code, using Python as the primary language and AI-powered coding assistants as development partners from day one. No prior programming experience is assumed. The first half covers core programming constructs: variables, control flow, functions, data structures, and file I/O. The second half introduces computational thinking patterns – decomposition, pattern recognition, abstraction, and algorithm design – and applies them to real-world datasets. Labs are structured as pair-programming sessions (both human-human and human-AI), building collaborative habits from the start. Projects are drawn from domains relevant to the broader program: analyzing social network data, simulating market dynamics, and visualizing public health data. Students learn to use AI coding tools effectively while developing the judgment to evaluate, test, and debug AI-generated code – a skill set that is becoming as fundamental as writing code itself. Students also learn foundational software practices including version control with Git, debugging strategies, and code documentation. By course end, students can independently write, test, and debug Python programs of moderate complexity, effectively leverage AI tools to accelerate development, and articulate the logic behind their code to non-technical audiences. TSI 110 is the entry point for the Technical Fluency strand and a prerequisite for all subsequent technical courses.

3.1.3 Spring Semester (15 credits)

Course	Credits	Type	Strand	Prerequisites
TSI 120 Human-Centered Design Thinking	3	Core	E – Design & Leadership	TSI 101
TSI 130 Ethics of Technology	3	Core	C – Ethics & Policy	TSI 101
TSI 140 Business Fundamentals for Technologists	3	Core	D – Innovation & Business	None
Humanities/Arts Elective I	3	Gen Ed	–	None
Science Elective II	3	Gen Ed	–	Varies

TSI 120 – Human-Centered Design Thinking (3 credits)

This course immerses students in the practice of designing technology with and for people rather than imposing solutions from above. Grounded in the Stanford d.school methodology, students cycle through empathize, define, ideate, prototype, and test phases multiple times during the semester. Projects partner with campus and community organizations to address real needs – redesigning a campus wayfinding system, improving a nonprofit's volunteer coordination, or rethinking a public library's digital services. Students conduct user interviews, build journey maps, create low-fidelity prototypes using paper, wireframes, and simple digital tools, and run usability tests with actual users. The course emphasizes inclusive design, accessibility standards (WCAG), and the importance of designing across differences in ability, culture, and context. Critiques and design reviews develop students' capacity to give and receive constructive feedback. By semester's end, students can lead a complete design cycle, justify design decisions with user evidence, and present their work persuasively. TSI 120 seeds the Design and Leadership strand and provides methods used throughout the capstone sequence.

TSI 130 – Ethics of Technology (3 credits)

This course equips students with the philosophical frameworks and practical tools needed to reason about the ethical dimensions of technology. Students study major ethical traditions – utilitarianism, deontology, virtue ethics, care ethics, and justice theory – and learn to apply them to technology cases. Topics include algorithmic bias and fairness, surveillance and privacy, digital labor and platform economies, autonomous systems and moral responsibility, and environmental impacts of computing. The course uses a case-study pedagogy: each week students prepare a case brief, engage in structured debate during class, and write a post-discussion reflection. A semester-long project requires teams to conduct an ethical audit of an existing technology product, producing a report with findings and recommendations. Students also learn about professional codes of ethics (ACM, IEEE) and emerging governance frameworks. By course end, students can identify ethical tensions in technology design and deployment, construct well-reasoned ethical arguments, and propose actionable remediation strategies. TSI 130 is foundational to the Ethics and Policy strand.

TSI 140 – Business Fundamentals for Technologists (3 credits)

This course introduces the economic and organizational logic that determines which technologies get built, funded, and scaled. Students learn core business concepts including value creation and capture, market analysis, competitive strategy, revenue models, cost structures, and basic financial literacy (reading income statements, balance sheets, and cash flow statements). The course contextualizes these concepts within the technology industry, examining how network effects, platform economics, switching costs, and winner-take-all dynamics shape markets differently from traditional industries. Case studies feature both startups and established technology companies, exploring decisions about pricing, market entry, pivoting, and scaling. Students work in teams to develop a business model canvas for a hypothetical technology venture, presenting their analysis in a pitch-style format. Guest speakers from the entrepreneurial ecosystem provide real-world perspective. By semester's end, students can evaluate the business viability of a technology concept, communicate effectively with business stakeholders, and understand how economic incentives influence technical decisions. TSI 140 launches the Innovation and Business strand.

3.1.4 Year 1 Portfolio Milestone: "My Technology Autobiography"

The Year 1 portfolio artifact is a reflective multimedia piece titled "My Technology Autobiography." Students begin this project in TSI 101 during the fall semester, drafting a narrative that connects their personal technology use – the devices they depend on, the platforms they inhabit, the algorithms that shape their information diet – to the systems concepts introduced in class.

During the spring semester, students revise and expand the piece, incorporating ethical analysis (from TSI 130), design thinking perspectives (from TSI 120), and business context (from TSI 140). The final version is a multimedia document (combining text, images, diagrams, and optionally video or audio) hosted on the student's portfolio site.

Assessment Criteria: - Demonstrates understanding of sociotechnical systems concepts - Applies at least two ethical frameworks to personal technology use - Identifies business models and incentive structures behind personally used technologies - Shows genuine self-reflection and intellectual growth - Communicates effectively through multimedia presentation

The autobiography serves as both an assessment of Year 1 learning and a baseline artifact that students will look back on in Year 4 to measure their intellectual growth.

Skills and Competencies Acquired by End of Year 1

By the end of Year 1, TSI students can credibly claim the following on a resume or in an interview:

Technical - Python programming (variables, functions, data structures, control flow, file I/O) - Data manipulation and visualization with Python libraries (e.g., pandas, matplotlib) - API consumption and JSON data parsing - Git version control and collaborative coding - Basic algorithmic thinking and computational problem-solving

Design - User interview design and facilitation - Affinity mapping and insight synthesis - Persona and journey map creation - Paper and digital prototyping (industry-standard design tools) - Usability testing and iterative design

Analytical - Systems mapping (causal loop diagrams, stakeholder maps) - Ethical framework application (utilitarian, deontological, virtue, care, justice) - Financial statement interpretation - Business model canvas development - Technology adoption pattern recognition

Communication - Structured written argumentation (ethics position paper) - Technical presentation and pitch delivery - Visual communication of complex systems - Reflective professional writing

3.1.5 Year 1 Learning Progression

The Year 1 courses are deliberately sequenced to create a compounding learning experience:

Fall foundations feed spring applications. TSI 101 (sociotechnical systems) provides the conceptual vocabulary that TSI 120, TSI 130, and TSI 140 all draw upon in spring. Students who can identify stakeholders, feedback loops, and system boundaries in fall are prepared to design for users (TSI 120), reason about ethics (TSI 130), and analyze business dynamics (TSI 140) in spring.

Technical and humanistic tracks develop in parallel. TSI 110 (programming) runs alongside TSI 101 (systems) in the fall, so students simultaneously build technical skill and contextual awareness. This parallelism is intentional: from the very first semester, students practice thinking about code and its consequences together.

Spring integration. By spring, students are working across all five strands (Systems, Technical, Ethics, Business, Design). TSI 120's design projects benefit from the ethical awareness of TSI 130 and the business thinking of TSI 140. The portfolio milestone ties everything together.

Gen Ed courses complement the core. STAT 201 (Introductory Statistics) directly supports TSI 110 and prepares students for Year 2's data science and AI courses. MATH 151 (Calculus I), taken as a technical depth elective, provides the mathematical foundations for TSI 212 (AI and Machine Learning Foundations). The writing seminar strengthens the communication skills used across all TSI courses. Science electives build empirical reasoning.

3.1.6 Recommended Gen Ed Choices

Quantitative Reasoning (Fall)

- **STAT 201 Introductory Statistics** is required for all TSI students in Year 1 Fall. Statistical reasoning is central to data science, AI, and policy analysis in Years 2-4. In addition, **MATH 151 Calculus I** (or equivalent) is required and counts as one of the two Technical Depth Electives. Students who place out of calculus via AP credit or placement exam satisfy this requirement automatically and take an additional technical elective of their choice. Students who do not place out should plan to take MATH 151 in Year 3 Fall alongside their first technical depth elective slot.

Science Electives

- **Environmental Science** or **Earth Systems Science** – connects directly to technology's environmental impact, a recurring TSI theme
- **Cognitive Science** or **Psychology 101** – provides foundations for human-computer interaction and design thinking
- **Biology with Lab** – useful for students interested in health technology or biotechnology concentrations

First-Year Writing Seminar

- Choose a section with a technology, science, or policy theme when available. Many writing seminars focus on topics like "Technology and Democracy" or "Science in the Public Sphere" that directly reinforce TSI coursework.

Humanities/Arts Elective (Spring)

- **Philosophy** (especially epistemology or philosophy of mind) – deepens the ethical reasoning introduced in TSI 130
- **Sociology** or **Anthropology** – complements the sociotechnical systems perspective
- **Visual Communication** or **Graphic Design** – supports design thinking and portfolio development

3.1.7 Student Experience: A Typical Week in Year 1

Monday - Morning: TSI 101 lecture (75 min) – this week's topic is platform ecosystems and network effects. The professor maps out how Uber's technology, drivers, riders, regulators, and urban infrastructure form an interconnected system. - Afternoon: Science Elective lab (2 hours) – hands-on experimental work.

Tuesday - Morning: STAT 201 (50 min) – working through probability distributions with technology-themed datasets. - Midday: TSI 110 lecture (75 min) – this week introduces dictionaries and working with JSON data. The in-class exercise involves parsing a dataset of app store reviews.

Wednesday - Morning: Writing Seminar (75 min) – peer workshop on draft essays. - Afternoon: TSI 101 discussion section (50 min) – small-group analysis of this week's assigned reading about algorithmic content moderation. - Evening: TSI 110 lab (2 hours) – pair programming session working on a project to analyze social network data.

Thursday - Morning: STAT 201 (50 min). - Afternoon: Science Elective lecture (50 min). - Free time for project work, office hours, or co-curricular activities.

Friday - Morning: Writing Seminar (75 min). - Afternoon: Study groups, project work, or co-curricular involvement.

Weekend - Readings for TSI 101 and Science Elective, programming assignments for TSI 110, writing assignments, and work on the Technology Autobiography portfolio piece.

Spring semester follows a similar rhythm, with TSI 120's studio sessions replacing lab time and TSI 130's case preparation requiring dedicated reading blocks.

3.1.8 Co-Curricular Recommendations for Year 1

Clubs and Organizations

- **TSI Student Association** – the program's home organization; hosts study groups, social events, and peer mentoring for first-years
- **Hackathon Club** – beginner-friendly hackathons help students apply TSI 110 skills in a team setting
- **Debate or Model UN** – sharpens the argumentation skills used in TSI 130 ethics discussions
- **Design for Good** – student-run design consultancy that pairs well with TSI 120

Events

- **TSI Welcome Symposium** (September) – upper-class students present capstone projects and share advice
- **Fall Hackathon** (October/November) – campus-wide event; Year 1 students encouraged to participate as learners
- **Ethics Bowl** (Spring) – intercollegiate competition in applied ethics; TSI 130 students are well-prepared
- **Design Showcase** (April) – TSI 120 teams present their community design projects

Competitions

- **Beginner Programming Contests** – low-pressure coding competitions that reinforce TSI 110 skills

- **Campus Innovation Challenge** – business pitch competition where TSI 140 concepts come alive
- **Civic Tech Challenge** – designing technology solutions for local government problems

Professional Development

- Attend at least two career center workshops during Year 1 (resume building, networking basics)
- Begin building a LinkedIn profile and connecting with TSI alumni
- Explore summer opportunities: research assistantships, pre-internship programs, or technology-focused volunteer work (formal TSI internships typically begin after Year 2)

3.2 Year 2: Building and Analyzing

3.2.1 Theme and Pedagogical Framework

Year 2 marks the transition from foundational understanding to applied competence. Students move from learning about sociotechnical systems to actively building and analyzing them. They develop technical depth in AI, data science, and systems analysis; sharpen their ability to evaluate technology through policy and organizational lenses; and begin to take on leadership roles in team settings. By the end of Year 2, students declare their concentration, setting the direction for their specialized work in Years 3 and 4. The year operates at the Apply and Analyze levels of Bloom's taxonomy: students are expected not only to use frameworks but to break problems apart, compare approaches, and defend their choices with evidence.

Year 2 also introduces greater professional expectations. Assignments increasingly mirror industry deliverables – technical reports, policy briefs, data analyses, and business cases. Students begin building the professional network and experience base that will support their Year 3 internship search.

3.2.2 Fall Semester (15 credits)

Course	Credits	Type	Strand	Prerequisites
TSI 210 Technology and Organizational Change	3	Core	A – Systems & Society	TSI 101, TSI 140
TSI 212 AI and Machine Learning Foundations	3	Core	B – Technical Fluency	TSI 110, MATH/STAT
TSI 220 Design and Prototyping for Technology Leaders	3	Core	E – Design & Leadership	TSI 120
TSI 240 Innovation and Entrepreneurship	3	Core	D – Innovation & Business	TSI 140
Social/Behavioral Science Elective (Economics recommended)	3	Gen Ed	–	None

TSI 210 – Technology and Organizational Change (3 credits)

This course examines how organizations adopt, resist, adapt to, and are transformed by technology. Drawing on organizational theory, management science, and the sociology of work, students study the dynamics of technology implementation in complex institutions. Topics include diffusion of innovations theory, technology acceptance models, organizational culture and its interaction with digital transformation, the politics of technology adoption, change management frameworks, and the restructuring of work through automation and AI. Case studies span industries – healthcare systems adopting electronic medical records, manufacturing firms implementing robotics, governments digitizing public services, and media companies navigating platform disruption. Students conduct a semester-long organizational analysis project in which they study a real organization's technology change initiative through interviews, document analysis, and framework application. The course develops skills in qualitative research methods, stakeholder analysis, and organizational diagnosis. By semester's end, students can analyze why technology implementations succeed or fail, identify organizational barriers to adoption, and design change management strategies. TSI 210 bridges Year 1's systems thinking with the strategic and leadership competencies of Years 3-4.

TSI 212 – AI and Machine Learning Foundations (3 credits)

This course provides a rigorous yet accessible introduction to the theory and practice of artificial intelligence and machine learning. Students learn the conceptual foundations behind supervised learning (regression, classification, decision trees, neural networks), unsupervised learning (clustering, dimensionality reduction), and reinforcement learning. The course balances conceptual understanding with hands-on implementation: students work with real datasets using standard ML libraries to solve prediction, classification, and pattern recognition problems. Critical attention is paid to model evaluation (bias-variance tradeoff, cross-validation, metrics selection), data preprocessing, and the limitations of ML approaches. The second half of the course extends into modern AI application patterns — large language models, retrieval-augmented generation, agentic AI systems, and tool use — equipping students to understand and work with the AI systems they will encounter in industry. Each technical topic is paired with a discussion of societal implications – how training data reflects historical biases, how model opacity creates accountability challenges, and how deployment context determines real-world impact. Students complete three major projects of increasing complexity, culminating in an AI application that composes pre-trained models and APIs into a working solution, accompanied by a written assessment of ethical considerations. TSI 212 is the technical gateway to the AI-focused courses in Year 3.

TSI 220 – Design and Prototyping for Technology Leaders (3 credits)

This course builds on the human-centered design foundations of TSI 120, advancing students' ability to translate user insights into tangible prototypes and to lead design processes within technology organizations. Students work with intermediate and high-fidelity prototyping tools – including industry-standard design platforms (currently Figma), interactive wireframes, and functional web prototypes – to develop solutions that address real user needs. The course covers design systems thinking, rapid prototyping methods, stakeholder communication through design artifacts, and the role of design in technology strategy. Students learn to facilitate design sprints, conduct structured design critiques, and manage the iterative cycle from concept through user testing to refinement. A major emphasis is placed on the leadership dimension of design: how to advocate for user-centered approaches within organizations, how to communicate design rationale to engineering and business stakeholders, and how to build a culture of design thinking in technical teams. The semester project requires student teams to partner with a campus or community organization to prototype a technology solution, conducting multiple rounds of user testing and iteration. By course end, students can lead a design process from problem framing through validated prototype and can articulate the strategic value of design within a technology organization. TSI 220 bridges the foundational design skills of TSI 120 with the leadership competencies developed in TSI 250.

TSI 240 – Innovation and Entrepreneurship (3 credits)

Building on the business fundamentals of TSI 140, this course dives into the theory and practice of innovation. Students study how technological innovation happens – from Schumpeter's creative destruction to Christensen's disruptive innovation to contemporary models of platform innovation and ecosystem orchestration. The course covers the full innovation lifecycle: opportunity identification, customer discovery, lean experimentation, minimum viable products, business model iteration, scaling strategies, and the role of intellectual property. Students work in teams to take a technology concept from idea through validated business model, conducting customer interviews, building prototypes, running experiments, and iterating based on evidence. The course also examines innovation from a systemic perspective: how venture capital, government policy, university research, and corporate R&D interact to create innovation ecosystems. Guest entrepreneurs and investors provide practitioner perspectives. By semester's end, students can evaluate the innovation potential of a technology concept, apply lean startup methodology, and articulate how macro-level forces shape innovation trajectories. TSI 240 prepares students for the strategic thinking required in Year 3's Technology Strategy course.

3.2.3 Spring Semester (15 credits)

Course	Credits	Type	Strand	Prerequisites
TSI 211 Data Science for Decision Making	3	Core	B – Technical Fluency	TSI 110, MATH/STAT
TSI 230 Technology Policy and Regulation	3	Core	C – Ethics & Policy	TSI 130
TSI 250 Leadership in Technical Organizations	3	Core	E – Design & Leadership	TSI 120
Social/Behavioral Science Elective II	3	Gen Ed	–	None
Exploratory Elective I	3	Exploratory Elective	–	None

TSI 211 – Data Science for Decision Making (3 credits)

This course teaches students to extract actionable insight from data and to communicate findings to decision-makers. Moving beyond the programming foundations of TSI 110 and the modeling focus of TSI 212, this course emphasizes the full data science workflow: formulating questions, acquiring and cleaning data, exploratory analysis, statistical modeling, visualization, and storytelling with data. Students work with real organizational datasets – sales data, public health records, social media streams, municipal open data – using Python (pandas, matplotlib, seaborn) and SQL. Topics include data wrangling, A/B testing, causal inference basics, dashboard design, and the ethics of data collection and use. A recurring theme is the gap between statistical findings and organizational action: students learn to tailor their communication to different audiences (executives, engineers, policymakers) and to be transparent about uncertainty and limitations. The semester project requires teams to partner with a campus office or local organization to answer a real decision-relevant question using data. By course end, students can independently execute a data analysis project and present findings that drive decisions. TSI 211 complements TSI 212 by focusing on analytical reasoning and communication rather than predictive modeling.

TSI 230 – Technology Policy and Regulation (3 credits)

This course examines how governments and international bodies regulate technology and how technology companies engage with the policy process. Building on the ethical foundations of TSI 130, students study the policy cycle – agenda setting, formulation, adoption, implementation, and evaluation – as it applies to technology issues. Topics include data privacy regulation (GDPR, state privacy laws), content moderation and platform liability (Section 230), antitrust and competition policy for digital markets, AI regulation, cybersecurity policy, biotechnology and genomic data governance, climate technology regulation, intellectual property in the digital age, and the digital divide. Students analyze real policy documents, track pending legislation, and participate in simulated regulatory proceedings. The course emphasizes comparative analysis: how different jurisdictions approach the same technology challenge. A semester-long policy memo project requires students to research a current technology policy issue, analyze stakeholder positions, evaluate policy alternatives using multiple criteria, and recommend a course of action. By course end, students can navigate the technology policy landscape, engage constructively with policymakers, and produce professional-quality policy analysis. TSI 230 prepares students for Year 3's AI Governance course and is essential for the AI Governance and Policy concentration.

TSI 250 – Leadership in Technical Organizations (3 credits)

This course develops the interpersonal, team, and organizational leadership skills that distinguish effective technology professionals. Building on the collaborative and human-centered foundations of TSI 120, students study leadership theories (transformational, servant, adaptive, distributed), team dynamics, conflict resolution, cross-functional communication, and the unique challenges of leading in technology-intensive environments where expertise is distributed and change is constant. The course uses experiential methods: students rotate through leadership roles in team projects, receive 360-degree peer feedback, complete self-assessments (StrengthsFinder, MBTI, or similar), and develop a personal leadership philosophy statement. Case studies examine both celebrated and cautionary examples of technology leadership – product launches, organizational crises, ethical whistleblowing, and culture-building. Students also practice facilitation skills, learn to run effective meetings, and develop their capacity to give and receive difficult feedback. By semester's end, students can articulate their leadership strengths and growth areas, lead diverse teams through ambiguous challenges, and adapt their leadership approach to different contexts. TSI 250 is foundational for the senior capstone's team-based work.

3.2.4 Concentration Declaration Process

Students declare their concentration by **April 15 of Year 2**. The declaration process is designed to be exploratory and supportive:

Exploration Phase (Year 1 - Fall Year 2)

- Year 1 core courses expose students to all five strands, helping them identify areas of interest
- Year 2 Fall's four core courses (TSI 210, TSI 212, TSI 220, TSI 240) deepen engagement across strands, helping students identify concentration preferences
- Faculty advisors meet with each student at least twice during Year 1 to discuss emerging interests

Decision Support (January - March Year 2)

- **Concentration Fair** (late January): faculty from each concentration present their track, answer questions, and share career outcome data
- **Peer Panels** (February): Year 3 and 4 students from each concentration share their experiences
- **Advisor Consultations** (February-March): each student meets with their advisor and at least one concentration faculty member to discuss fit
- **Shadow Days** (by arrangement): students can sit in on Year 3 concentration courses to preview the experience

Declaration (April)

- Students submit a brief declaration form indicating their chosen concentration and a short rationale
- Declarations are reviewed by the concentration coordinator to ensure prerequisite alignment
- Students may change concentrations through the end of fall Year 3 with advisor approval, though course sequencing may be affected

Available Concentrations

1. **AI Governance and Policy** – designing, implementing, and evaluating governance mechanisms for AI and other emerging technologies
2. **Product and Innovation Management** – the full product management toolkit: discovery, strategy, execution, and growth
3. **Human-Centered Technology Design** – advanced design skills encompassing interaction design, inclusive design, service design, and design research
4. **Technology Strategy and Entrepreneurship** – strategic thinking and execution skills for leading technology-driven organizations and ventures

3.2.5 Year 2 Portfolio Milestone: "Technology Impact Analysis"

The Year 2 portfolio artifact is a structured analysis of a real technology deployment, examining it through four lenses corresponding to the program's core strands.

Assignment Structure

Students select a specific technology deployment (not a technology in general, but a particular implementation in a particular context – e.g., a city's smart transportation system, a hospital's AI diagnostic tool, an energy utility's grid modernization project, a company's algorithmic hiring platform). They then produce a comprehensive analysis addressing:

1. **Technical Architecture** (drawing on TSI 212, TSI 211): How does the system work? What data does it use? What are its technical capabilities and limitations?
2. **Organizational Impact** (drawing on TSI 210): How has this technology changed the organization? Who adopted it, who resisted, and why? What change management approaches were used?
3. **Ethical and Policy Dimensions** (drawing on TSI 230): What ethical tensions does this deployment create? What regulatory frameworks apply? What policy reforms might be needed?
4. **Business and Innovation Context** (drawing on TSI 240): What was the business case? How does this fit within broader market and innovation dynamics?

Deliverables

- Written report (4,000-5,000 words) with evidence from at least 10 sources
- A systems map visualizing the technology's sociotechnical context
- A 10-minute recorded presentation summarizing key findings
- Peer review of one classmate's analysis

Assessment Criteria

- Depth and accuracy of technical analysis
- Sophistication of organizational and ethical reasoning
- Quality of evidence and source diversity
- Integration across the four analytical lenses
- Clarity and professionalism of presentation

Skills and Competencies Acquired by End of Year 2

Building on Year 1, TSI students add the following by the end of Year 2:

Technical - Machine learning fundamentals: understanding, evaluating, and applying supervised/unsupervised models using standard ML libraries - Neural network concepts and practical implementation - Modern AI application patterns: large language models, retrieval-augmented generation, agentic workflows - Working with pre-trained models and AI APIs - Statistical inference: hypothesis testing, confidence intervals, regression - A/B testing design and analysis - SQL basics for data extraction - Data visualization best practices and dashboard concepts

Design - Intermediate proficiency in industry-standard design tools (high-fidelity prototyping, design systems) - Interaction design principles and information architecture - Service blueprint creation - Accessibility auditing (WCAG 2.2 basics) - Design critique using professional vocabulary

Strategy and Business - Innovation and entrepreneurship: customer discovery, lean startup, MVP strategy - Business model iteration and pivot decision-making - Organizational change analysis (Kotter, ADKAR frameworks) - Technology adoption and diffusion models

Policy and Governance - Regulatory analysis (GDPR, EU AI Act, Section 230) - Policy brief writing - Policy simulation and multi-stakeholder negotiation - AI fairness auditing fundamentals

Leadership - Facilitation and meeting leadership - Negotiation and conflict resolution (role-play validated) - 360-degree self-assessment and personal leadership planning - Cross-functional team collaboration

3.2.6 Year 2 Learning Progression

Year 2 courses build on each other and on Year 1 in deliberate ways:

Fall semester deepens and applies Year 1 foundations. TSI 210 extends TSI 101's systems lens into organizational contexts, now requiring students to analyze (not just describe) how technology and organizations co-evolve. TSI 212 transforms TSI 110's programming skills into the capacity to build and evaluate ML models. TSI 220 advances TSI 120's design foundations into intermediate prototyping and design leadership. TSI 240 elevates TSI 140's business literacy into the ability to drive innovation processes.

Technical courses form a two-semester sequence. TSI 212 (fall) focuses on building predictive models; TSI 211 (spring) focuses on analytical reasoning and communicating with data. Together they produce a student who can both build and interpret data-driven systems – a rare and valuable combination.

Policy and leadership complete the picture. TSI 230 (spring) moves from the individual ethical reasoning of TSI 130 to the institutional and governmental scale. TSI 250 (spring) transforms TSI 120's collaborative design experience into explicit leadership capacity.

The portfolio milestone integrates everything. The Technology Impact Analysis requires students to use all four analytical lenses simultaneously, demonstrating that they can move fluidly across technical, organizational, ethical, and business perspectives.

3.2.7 Technical Depth Elective Guidance

TSI students take two Technical Depth Electives (6 credits). One of these slots is filled by MATH 151 Calculus I for students who did not place out of calculus; students who placed out via AP credit or placement exam take two electives of their choice. The first technical depth elective is typically taken in Year 3 Fall, and the second in Year 4 Fall. Recommended choices depend on intended concentration:

For AI Governance and Policy

- **CS 201 Data Structures and Algorithms** – essential computer science foundations
- **Cybersecurity Fundamentals** – technical literacy for governance roles

For Product and Innovation Management

- **CS 150 Web Development** – ability to build MVPs and prototypes
- **Database Systems** – understanding data infrastructure for product decisions

For Human-Centered Technology Design

- **PSYCH 210 Cognitive Psychology** – understanding human cognition for interface design
- **ART 180 Digital Media and Interaction** – creative prototyping and visual design skills

For Technology Strategy and Entrepreneurship

- **Cloud Computing / Distributed Systems** – understanding technical infrastructure for strategic decisions
- **ECON 210 Econometrics** – quantitative methods for market and financial analysis

3.2.8 Preparation for Industry

Year 2 systematically prepares students for professional engagement:

Skills Readiness

By the end of Year 2, students can write production-quality Python code, build and evaluate ML models, conduct data analysis, produce policy briefs, lead teams, and present to professional audiences. This skill set makes them competitive for summer internships and part-time technology roles.

Professional Development Milestones

- **September**: Attend career fair; update resume with Year 1 projects and TSI-specific skills
- **October**: Begin informational interviews with professionals in areas of interest
- **November-December**: Identify target companies and organizations for summer opportunities
- **January-February**: Submit internship applications (formal TSI internship is Year 3 summer, but many students pursue exploratory summer experiences after Year 2)
- **March**: Participate in mock interviews and portfolio reviews with TSI alumni mentors
- **April**: Concentration declaration crystallizes professional identity

Portfolio as Professional Asset

The portfolio – now containing the Technology Autobiography (Year 1) and Technology Impact Analysis (Year 2) – becomes a tangible demonstration of capabilities that goes far beyond a traditional resume. Students learn to present their portfolio in professional contexts.

Industry Connections

- TSI Industry Advisory Board members offer mentorship pairings beginning in Year 2
- Company site visits (two per semester) expose students to different organizational cultures
- The TSI Speaker Series brings practitioners to campus biweekly

- Alumni networking events connect current students with TSI graduates in the field

3.3 Year 3: Going Deep and Going Out

3.3.1 Theme and Pedagogical Framework

Year 3 is where specialization and real-world engagement converge. Students deepen their expertise through concentration courses, tackle advanced core topics in complex systems and AI governance, and complete the program's hallmark experiential requirement: a substantive industry internship. The year operates at the Analyze and Evaluate levels of Bloom's taxonomy. Students are expected to dissect complex problems, weigh competing solutions, make evidence-based judgments, and defend their positions against informed critique.

The structure of Year 3 reflects its dual emphasis. The fall is intensive and intellectually demanding, with two advanced core courses and two concentration courses running simultaneously. The spring carries a full 15-credit load with three core courses, a concentration course, and an elective, reflecting the addition of TSI 350 (Applied Leadership Practicum) to the Strand E sequence. The summer internship bridges academic learning and professional practice, giving students a sustained engagement with a real organization.

3.3.2 Fall Semester (15 credits)

Course	Credits	Type	Strand	Prerequisites
TSI 310 Complex Adaptive Systems	3	Core	A – Systems & Society	TSI 210
TSI 330 AI Governance and Responsible Innovation	3	Core	C – Ethics & Policy	TSI 230, TSI 212
Concentration Course 1	3	Concentration	–	Varies
Concentration Course 2	3	Concentration	–	Varies
Technical Depth Elective I	3	Tech Elective	–	Varies

TSI 310 – Complex Adaptive Systems (3 credits)

This course represents the most advanced expression of the Systems and Society strand, moving from the descriptive and analytical frameworks of Years 1-2 to the study of systems that exhibit emergence, self-organization, and nonlinear dynamics. Students learn complexity theory, agent-based modeling, network science, power law distributions, tipping points, and resilience theory, applying these concepts to technology ecosystems and organizational dynamics. The course uses agent-based modeling tools (e.g., NetLogo) and Python-based simulation libraries to build computational models of complex phenomena: how technologies diffuse through social networks, how platform ecosystems evolve, how organizational routines emerge and dissolve, and how cascading failures propagate through interconnected infrastructure. Case studies examine real complex systems across multiple technology domains – the internet's architecture, energy grid transitions, synthetic biology ecosystems, smart city initiatives, pandemic response networks, and AI deployment cascades. Students develop the capacity to recognize when traditional linear analysis is insufficient and to use complexity-appropriate tools instead. The semester project requires students to model a complex sociotechnical system, validate the model against real-world data, and use it to explore policy or design interventions. By course end, students can apply complexity thinking to strategic and policy questions, a skill that distinguishes TSI graduates.

TSI 330 – AI Governance and Responsible Innovation (3 credits)

This course sits at the intersection of the Ethics and Policy strand and the Technical Fluency strand, requiring students to bring both technical understanding and policy sophistication to the urgent questions surrounding AI governance. Topics include AI risk taxonomies, algorithmic auditing methods, fairness metrics and their tradeoffs, transparency and explainability requirements, liability frameworks for autonomous systems, international AI governance regimes, the EU AI Act and comparable regulatory frameworks, industry self-governance initiatives, and the role of technical standards in regulation. Students conduct hands-on algorithmic audits using real systems and datasets, learning to operationalize fairness definitions and identify disparate impacts. The course also examines responsible innovation frameworks – anticipation, reflexivity, inclusion, and responsiveness – as proactive alternatives to reactive regulation. Students produce two major deliverables: a technical audit report on an AI system and a governance proposal addressing a specific AI policy challenge. Guest speakers include regulators, industry ethics leads, civil society advocates, and AI researchers. TSI 330 is the most integrative course in the Ethics and Policy strand, demanding that students synthesize technical, ethical, legal, and political reasoning.

3.3.3 Spring Semester (15 credits)

Course	Credits	Type	Strand	Prerequisites
TSI 311 Building Intelligent Systems	3	Core	B – Technical Fluency	TSI 212, TSI 211
TSI 340 Technology Strategy and Business Models	3	Core	D – Innovation & Business	TSI 240
TSI 350 Applied Leadership Practicum	3	Core	E – Design & Leadership	TSI 250
Concentration Course 3	3	Concentration	–	Varies
Exploratory Elective II	3	Exploratory Elective	–	None

TSI 311 – Building Intelligent Systems (3 credits)

This is a hands-on, project-intensive course in which students design, orchestrate, and deploy AI-native systems. Where TSI 212 taught the foundations of how AI models work, TSI 311 teaches students to compose AI capabilities into complete systems that solve real problems — the transition from understanding individual models to architecting multi-component intelligent applications. The course covers four major project cycles: AI-powered application design (composing pre-trained models, APIs, and custom logic into coherent systems), agentic AI systems (designing autonomous agents with tool use, planning, memory, and multi-agent coordination), human-AI interaction patterns (designing effective human-in-the-loop workflows, evaluation frameworks, and feedback mechanisms), and system reliability and deployment (monitoring, evaluation, safety guardrails, and maintenance of AI systems in production). Students work with current industry-standard frameworks for model serving, API design, and containerization — specific tools are updated annually to reflect the rapidly evolving landscape. Each project cycle follows a professional workflow: requirements gathering, system architecture, component integration, evaluation, deployment, and documentation. The course emphasizes the emerging discipline of AI systems engineering — not just building models, but designing the orchestration layer that connects AI capabilities to human needs. By course end, students can design, build, deploy, and evaluate an AI-native system end-to-end, a capstone-ready technical skill.

TSI 340 – Technology Strategy and Business Models (3 credits)

This course elevates the innovation and entrepreneurship foundations of Years 1-2 into strategic thinking about how technology companies and technology-enabled organizations create and sustain competitive advantage. Students study platform strategy, ecosystem orchestration, data-driven business models, technology-as-a-service economics (including AI, cloud, and platform models), technology adoption lifecycle management, strategic pivots, and the dynamics of technology standards and dominant designs. The analytical toolkit includes industry analysis (Porter's Five Forces adapted for digital markets), resource-based view, dynamic capabilities, and real options thinking for technology investments. Case studies examine both technology giants and smaller firms navigating strategic inflection points: how to respond to disruptive entrants, when to build versus buy versus partner, how to monetize technology capabilities, and how to balance innovation exploration with operational exploitation. Students produce a comprehensive technology strategy analysis for a real company, including competitive positioning, capability assessment, and strategic recommendations. The course also addresses the strategist's ethical obligations – how strategic decisions about data, algorithms, and market power carry social consequences. TSI 340 provides the strategic lens that capstone teams will need when working with their industry sponsors.

TSI 350 – Applied Leadership Practicum (3 credits)

This course is the culminating experience of the Design and Leadership strand, requiring students to apply the leadership theories and design methods developed in TSI 120, TSI 220, and TSI 250 to a sustained, real-world team engagement. Student teams of 3-4 are matched with campus organizations, community partners, or early-stage ventures facing a challenge that requires both design thinking and organizational leadership. Over the course of the semester, teams lead a complete engagement cycle: scoping the challenge with stakeholders, facilitating collaborative problem-solving sessions, developing and testing solutions, and delivering actionable recommendations. The course emphasizes leadership-in-practice: students rotate through defined leadership roles (project lead, facilitator, stakeholder liaison, documentation lead), receive structured peer feedback after each rotation, and maintain a leadership reflection journal. Weekly seminars address advanced topics including adaptive leadership in ambiguous situations, leading across organizational boundaries, conflict resolution in high-stakes settings, and building coalitions for change. Students also study cases of design-led organizational transformation and technology leadership failures. By course end, students can lead a cross-functional team through a complex engagement, adapt their leadership style to different contexts and stakeholders, and articulate a mature personal leadership philosophy grounded in practice. TSI 350 provides direct preparation for the senior capstone's team-based, sponsor-facing work.

3.3.4 Summer (3 credits)

Course	Credits	Type	Strand	Prerequisites
TSI 395 Internship Experience	3	Experiential	–	Completion of Year 2; advisor approval

TSI 395 – Internship Experience (3 credits)

The internship is a minimum 10-week, full-time professional experience with an approved employer. Students work in roles that engage their TSI skills – technology strategy, product management, data science, AI implementation, technology policy, UX research, digital transformation, or innovation management. The academic component requires students to maintain a structured reflection journal, participate in biweekly virtual check-ins with their faculty supervisor, and produce a final internship report that connects their professional experience to TSI frameworks. The report becomes the foundation for the Year 3 portfolio milestone.

Approved employers span sectors: technology companies, consulting firms, government agencies, nonprofits, startups, research labs, and international organizations. The TSI program maintains partnerships with a network of employers who understand the program's interdisciplinary nature and commit to providing substantive learning experiences.

3.3.5 Year 3 Portfolio Milestone: "Professional Case Study"

Drawing directly on the internship experience, the Year 3 portfolio artifact is a professional case study analyzing a technology decision encountered during the internship.

Structure

- **Context** (500 words): the organization, its technology landscape, and the specific decision or challenge
- **Technical Analysis** (800 words): the technology involved, its architecture, capabilities, and limitations
- **Organizational and Strategic Analysis** (800 words): stakeholder dynamics, strategic implications, change management considerations

- **Ethical and Policy Dimensions** (600 words): ethical tensions, regulatory considerations, and societal impact
- **Evaluation and Recommendations** (800 words): the student's assessment of the decision, alternative approaches, and lessons learned
- **Reflection** (500 words): how the experience connects to TSI coursework and shapes the student's professional identity

Assessment Criteria

- Depth and specificity of organizational context
- Sophistication of multi-framework analysis
- Quality of evaluative reasoning (not just description, but judgment)
- Professional maturity and self-awareness in reflection
- Appropriate handling of confidential information (students work with their employer to ensure the case respects proprietary boundaries)

Skills and Competencies Acquired by End of Year 3

By the end of Year 3 (including internship), TSI students add:

Technical - Designing and orchestrating AI-native systems (agentic workflows, multi-component architectures, human-AI interaction patterns) - Agent-based modeling and simulation of complex systems - Network science analysis (centrality, community detection, scale-free networks) - AI system evaluation, reliability engineering, and deployment

Governance (for all students, deeper for AI Gov concentration) - Algorithmic impact assessment methodology - Technology governance framework analysis (e.g., NIST AI RMF, EU AI Act, ISO 42001) - Documentation standards for AI systems (e.g., model cards, datasheets) - Organizational AI governance program design

Strategy (for all students, deeper for Strategy concentration) - Platform and ecosystem strategy analysis - Digital transformation assessment - Case-method strategic analysis - Technology M&A and investment evaluation concepts

Leadership - Client engagement management (scoping, deliverables, stakeholder navigation) - Rotating team leadership in real-world project contexts - Professional consulting skills - Project recovery and adaptive leadership under pressure

Professional - 10+ weeks of structured industry internship experience - Professional case study writing from real organizational experience - Concentration-specific depth (see concentration tracks for details)

3.3.6 Internship Preparation Timeline

The internship search is a structured process supported by the TSI program and the university career center:

Year 2 Fall (September - December)

- Attend TSI Industry Night (October) to meet employer partners
- Update portfolio and resume with Year 1-2 projects
- Begin informational interviews with professionals in target fields
- Identify 15-20 target organizations

Year 2 Spring (January - April)

- **January-February**: Primary application period for summer internships
- **February**: TSI mock interview week with alumni and industry mentors
- **March**: Campus recruiting events and virtual career fairs
- **April**: Most offers received; students confirm placement with TSI internship coordinator

Year 3 Fall (September - December)

- For students interning the following summer: repeat the Year 2 timeline
- For students with early internship commitments: begin pre-internship preparation (reading, skill-building)

Year 3 Spring (January - May)

- Final internship preparation: pre-reading on employer's industry, technology review
- Meet with faculty supervisor to establish learning objectives and reflection framework
- Administrative requirements: learning agreement signed by student, employer, and faculty supervisor

3.3.7 Concentration Course Previews

AI Governance and Policy

Course	Description
TSI 331 Algorithmic Auditing and Accountability	Technical methods for auditing algorithmic systems: bias detection, fairness metrics, and accountability frameworks.
TSI 332 Data Governance and Privacy Engineering	Designing and implementing data governance frameworks, privacy-by-design, and compliance with regulatory requirements.
TSI 431 AI Safety and Alignment	Technical and philosophical dimensions of AI safety, alignment research, and existential risk assessment.
TSI 432 Comparative Technology Governance	How different jurisdictions govern AI and emerging technologies: US, EU, China, and Global South approaches.

Course	Description
TSI 433 Practicum in AI Governance	Semester-long engagement with a government agency, think tank, or industry partner on a live governance challenge.

Product and Innovation Management

Course	Description
TSI 341 Product Management Fundamentals	Roadmapping, prioritization, cross-functional leadership, and metrics-driven product development.
TSI 342 User Research and Analytics	Qualitative and quantitative methods for understanding user behavior and informing product decisions.
TSI 441 Advanced Product Strategy	Platform strategy, product-led growth, competitive positioning, and portfolio management.
TSI 442 Growth, Metrics, and Experimentation	A/B testing, growth modeling, cohort analysis, and building a culture of experimentation.
TSI 443 Product Studio	Team-based product development engagement with an industry partner from discovery through delivery.

Human-Centered Technology Design

Course	Description
TSI 321 Interaction Design and Prototyping	Advanced interaction design methods, high-fidelity prototyping, and design systems.
TSI 322 Inclusive and Accessible Design	Universal design, assistive technology, designing across disability, age, culture, and literacy.
TSI 421 Design Research Methods	Advanced qualitative and quantitative research methods for design: ethnography, diary studies, and participatory design.
TSI 422 Service and Systems Design	Designing at the service and systems level: service blueprints, organizational design, and systemic intervention.
TSI 423 Design Studio	Semester-long design engagement with a community or industry partner.

Technology Strategy and Entrepreneurship

Course	Description
TSI 343 Venture Creation and Startup Finance	Hands-on venture creation: from customer discovery through MVP to investor pitch and financial modeling.
TSI 344 Digital Transformation Management	Leading technology-driven change in established organizations: strategy, execution, and culture.
TSI 444 Technology M&A and Investment	Evaluating technology acquisitions, investment thesis development, and due diligence.
TSI 445 Scaling Technology Ventures	Growth strategy, organizational design for scale, fundraising, and board governance.
TSI 446 Strategy Practicum	Mentored strategic consulting engagement with a technology company or venture.

3.3.8 Year 3 Learning Progression

Fall semester pushes to advanced analysis. TSI 310 (Complex Adaptive Systems) demands that students move beyond linear cause-and-effect thinking to grapple with emergence and nonlinearity. TSI 330 (AI Governance) requires them to integrate technical knowledge from TSI 212 with policy frameworks from TSI 230 – a synthesis that only works because both prerequisites are in place.

Concentration courses build specialized depth. The two fall concentration courses establish the technical or domain-specific vocabulary of the student's chosen track, while the spring concentration course extends into more advanced territory.

Spring semester balances depth with synthesis. TSI 311 (Building Intelligent Systems) is the most technically demanding course in the core, but it runs alongside TSI 340 (Technology Strategy), which requires a bird's-eye strategic perspective, and TSI 350 (Applied Leadership Practicum), which puts leadership skills into sustained practice. This deliberate pairing trains students to zoom in on technical detail, zoom out to strategic context, and lead teams through ambiguous challenges – all critical professional skills that converge in the senior capstone.

The internship integrates everything. The summer experience is not an add-on but the culmination of Year 3's learning arc. Students bring their full TSI toolkit – systems thinking, technical skills, ethical reasoning, business acumen, leadership capacity – into a professional setting and test it against reality.

3.3.9 Study Abroad Guidance

Year 3 offers opportunities for international experience, though planning must begin early to ensure course sequencing is preserved.

Recommended study abroad windows:

- **Summer between Year 2 and Year 3 (most recommended):** A summer study abroad program does not disrupt the academic year sequence. Credits can count toward exploratory electives or general education requirements. Students gain international perspective before entering their concentration coursework.
- **Year 3 Spring (advanced option):** Students may study at an approved partner institution that offers equivalents of TSI 311 (Building Intelligent Systems), TSI 340 (Technology Strategy), and TSI 350 (Applied Leadership Practicum). This requires advance approval from the TSI Curriculum Committee and the student's concentration advisor. The third concentration course can also be taken abroad if an equivalent is available.
- **Year 2 Spring (alternative):** Students with fewer core-specific constraints can take TSI 211, TSI 230, and TSI 250 (or equivalents) at partner institutions abroad. This window works well for students who plan ahead.

Planning requirements: - Students considering study abroad should discuss plans with their advisor no later than fall of the year preceding departure. - All course equivalencies must be pre-approved by the TSI Curriculum Committee. - The TSI Program Office maintains a list of approved partner institutions with pre-evaluated course equivalencies, including programs in Europe, East Asia, and Latin America that align with TSI's interdisciplinary focus. - Students studying abroad during a spring semester should plan to complete all fall core courses in the preceding semester before departing.

3.4 Year 4: Creating and Leading

3.4.1 Theme and Pedagogical Framework

Year 4 is where everything converges. Students operate at the highest levels of Bloom's taxonomy – Evaluate and Create – synthesizing four years of learning into original, consequential work. The centerpiece is the year-long Senior Capstone, a team-based, industry-sponsored project that produces a real deliverable for a real organization. Alongside the capstone, students complete their concentration, take advanced electives, and engage in structured career preparation.

By the end of Year 4, TSI graduates are not merely knowledgeable about the relationship between technology and society – they are prepared to shape it. They can lead interdisciplinary teams, build and evaluate intelligent systems, navigate policy and ethical complexity, think strategically about innovation, and communicate their ideas with authority and nuance.

3.4.2 Fall Semester (15 credits)

Course	Credits	Type	Strand	Prerequisites
TSI 410 Technology Futures and Foresight	3	Core	A – Systems & Society	TSI 310

Course	Credits	Type	Strand	Prerequisites
TSI 491 Senior Capstone I	3	Experiential	–	Senior standing; all core through Year 3
Concentration Course 4	3	Concentration	–	Varies
Technical Depth Elective II	3	Tech Elective	–	Varies
Exploratory Elective III	3	Exploratory Elective	–	None

TSI 410 – Technology Futures and Foresight (3 credits)

This capstone course for the Systems and Society strand trains students to think rigorously about the future of technology and its societal implications. Students study strategic foresight methodologies – scenario planning, horizon scanning, Three Horizons Framework, causal layered analysis, backcasting, Wardley Mapping, and weak signal detection – and apply them to emerging technology domains. The course examines historical predictions about technology (both prescient and spectacularly wrong) to develop epistemic humility about forecasting while still building the capacity to prepare for multiple futures. Topics include the trajectory of artificial intelligence, biotechnology convergence, climate technology, the future of work and automation, space technology, quantum computing, and the geopolitics of technology competition. Students work in teams to produce a comprehensive foresight report on a technology domain of their choice, developing multiple scenarios, identifying strategic implications, and proposing robust strategies that perform well across scenarios. The course emphasizes that foresight is not about predicting the future but about expanding the range of futures an organization can perceive and prepare for. Guest speakers include professional futurists, strategy consultants, and technology executives. TSI 410 develops the forward-looking perspective that distinguishes strategic leaders from tactical operators.

TSI 491 – Senior Capstone I (3 credits)

The first semester of the year-long capstone sequence focuses on problem definition, research, and approach development. Teams of 4-5 students are matched with industry sponsors based on project requirements and student expertise. Each team includes students from at least two different concentrations, mirroring the interdisciplinary reality of professional technology work. During Capstone I, teams work through a structured process:

- **Weeks 1-3: Sponsor Engagement and Problem Scoping.** Teams meet with their industry sponsor to understand the organizational context, clarify the problem, and negotiate project scope. Deliverable: project charter.
- **Weeks 4-7: Research and Analysis.** Teams conduct background research, stakeholder interviews, competitive analysis, and technical feasibility assessment. Deliverable: research synthesis report.

- **Weeks 8-11: Approach Development.** Teams develop their proposed approach – technical architecture, methodology, timeline, and resource plan. Deliverable: approach proposal and prototype/proof of concept.
- **Weeks 12-14: Midpoint Review.** Teams present their progress to the sponsor, faculty panel, and peer teams for feedback. Deliverable: midpoint presentation and revised project plan for spring.

Faculty serve as project advisors (one per team), meeting weekly to provide guidance on methodology, team dynamics, and sponsor management. A capstone seminar (90 minutes per week) addresses cross-cutting topics: project management, team conflict resolution, sponsor communication, and professional presentation skills.

3.4.3 Spring Semester (15 credits)

Course	Credits	Type	Strand	Prerequisites
TSI 492 Senior Capstone II	6	Experiential	–	TSI 491
Concentration Course 5	3	Concentration	–	Varies
Humanities/Arts Elective II	3	Gen Ed	–	None
Diversity & Global Perspectives	3	Gen Ed	–	None

TSI 492 – Senior Capstone II (6 credits)

The second semester is execution, iteration, and delivery. The expanded credit load (6 credits) reflects the intensive nature of this phase. Teams move from approach to working artifact, cycling through build-test-iterate loops with regular sponsor feedback.

- **Weeks 1-4: Core Development.** Teams execute their technical and analytical plan, building the primary deliverable. Weekly sponsor check-ins ensure alignment.
- **Weeks 5-8: Testing and Iteration.** Teams test their solution with real users or stakeholders, gather feedback, and iterate. Emphasis on evidence-based refinement.
- **Weeks 9-11: Integration and Polish.** Teams finalize their deliverable, prepare documentation, and develop the strategic recommendations report.
- **Week 12: Sponsor Handoff.** Teams deliver the working artifact and supporting materials to the sponsor in a professional handoff meeting. Deliverable: working artifact, technical documentation, and strategic recommendations report.
- **Weeks 13-14: Public Defense.** Teams present their project in a public symposium attended by sponsors, faculty, students, alumni, and invited guests. Deliverable: 30-minute presentation followed by 15-minute Q&A.

The capstone seminar continues in spring, focusing on delivery management, stakeholder communication, and the transition from student team to professional handoff. Teams also contribute to a "lessons learned" document that benefits future capstone cohorts.

3.4.4 Capstone Overview

The Senior Capstone is the defining experience of the TSI program. It is designed to be as close to professional practice as possible while maintaining academic rigor.

Team Composition

Teams of 4-5 students are intentionally composed to include members from at least two different concentrations. A team might include an AI Governance and Policy student, a Product and Innovation Management student, a Human-Centered Technology Design student, and a Technology Strategy and Entrepreneurship student – mirroring the cross-functional teams that drive technology work in industry.

Industry Sponsorship

Each project is sponsored by a real organization – a technology company, a government agency, a healthcare system, a nonprofit, a financial institution, or a startup. Sponsors commit to: - Defining a meaningful, scoped problem - Providing a primary point of contact who meets with the team biweekly - Giving access to relevant data, systems, and stakeholders (within appropriate boundaries) - Attending midpoint review and final defense - Providing candid feedback throughout the process

Faculty Advising

Each team has a dedicated faculty advisor who provides methodological guidance, helps navigate team dynamics, and ensures academic standards are met. Advisors meet with their teams weekly and coordinate with the capstone director.

3.4.5 Capstone Phases

Fall: Problem Definition, Research, and Approach Development

The fall semester is about understanding before acting. Teams resist the temptation to jump to solutions and instead invest deeply in understanding the problem space, the organizational context, and the stakeholder landscape. The midpoint review serves as a quality gate: teams must demonstrate sufficient understanding and a credible approach before proceeding to execution.

Spring: Execution, Iteration, and Delivery

The spring semester is about building, testing, and delivering. Teams operate with increasing autonomy, managing their own timelines and sponsor relationships. The iterative structure ensures that the final deliverable reflects real user needs, not just the team's initial assumptions.

3.4.6 Capstone Deliverables

1. **Working Artifact** – This varies by project: a software application, an AI system, a data analytics platform, a policy framework, a strategic plan, a service design, or a combination. The artifact must be functional and useful to the sponsor, not merely a prototype.

2. **Strategic Recommendations Report** – A written document (8,000-12,000 words) that contextualizes the artifact within the sponsor's broader strategic landscape. Includes implementation recommendations, risk analysis, ethical considerations, and a sustainability plan for maintaining the work after the team departs.
3. **Sponsor Handoff Package** – Technical documentation, user guides, training materials, and any necessary code repositories or data assets, delivered in a format the sponsor can immediately use.
4. **Public Defense** – A 30-minute presentation to a public audience, followed by 15 minutes of questions from a panel that includes the sponsor, faculty, and an external evaluator. This is the program's most visible moment and a significant professional milestone.

3.4.7 Year 4 Portfolio Milestone: Comprehensive Portfolio

The Year 4 portfolio is the cumulative artifact of the entire TSI education. It is not a new standalone project but a curated, reflective compilation.

Components

1. **Capstone Project Documentation** – The centerpiece. Includes a summary of the capstone project, the student's specific contributions, key decisions and their rationale, and lessons learned.
2. **Curated Four-Year Artifacts** – Students select and contextualize their best work from each year:
    - Year 1: My Technology Autobiography (revised with hindsight)
    - Year 2: Technology Impact Analysis
    - Year 3: Professional Case Study
    - Additional artifacts from concentration courses, technical electives, or extracurricular projects
3. **Reflective Essay** (2,000-3,000 words) – A mature reflection on the student's intellectual and professional growth, addressing:
    - How their understanding of the technology-society relationship has evolved
    - What they believe about the role of technologists in society
    - How they intend to carry TSI's interdisciplinary perspective into their career
    - Areas where they still have questions and intend to keep learning
4. **Public Presentation** – A 15-minute presentation of the portfolio, typically delivered at the TSI Senior Showcase in April. This is distinct from the capstone defense; it focuses on the individual student's growth and trajectory.

Assessment Criteria

- Breadth and depth of curated work across all five program strands
- Quality and specificity of reflective analysis

- Evidence of intellectual growth from Year 1 to Year 4
- Professional polish and coherent narrative
- Effectiveness of public presentation

Skills and Competencies Acquired by End of Year 4

By graduation, TSI students have added:

Foresight and Assessment - Scenario planning (2x2 matrix methodology, narrative development) - Horizon scanning and weak signal identification (STEEP analysis) - Technology roadmapping (product, industry, and science-based) - Three Horizons Framework for mapping technology transitions - Wardley Mapping for technology value chain analysis - Backcasting from preferred futures - Causal layered analysis

Capstone / Professional - Year-long project management with external stakeholder accountability - Professional deliverable production (working prototype, strategy document, governance framework, or design system — depending on concentration) - Public defense and presentation of complex interdisciplinary work - Sponsor relationship management and professional handoff - Comprehensive portfolio curation demonstrating 4 years of growth

Integration - The ability to synthesize technical, design, business, ethical, and policy perspectives into a coherent project — the signature TSI capability - Demonstrated cross-functional team leadership over an extended engagement - Professional-quality work artifacts suitable for employer review

3.4.8 Career Launch Support

Year 4 is structured to ensure students are career-ready upon graduation:

Through Coursework

- **TSI 410** develops strategic foresight skills valued in consulting, strategy, and executive leadership roles
- **TSI 491/492** provides a portfolio-ready project, an industry reference, and demonstrated ability to deliver in a professional context
- **Concentration Course 5** provides final specialized depth
- The portfolio serves as a powerful career marketing tool that goes far beyond a resume

Through Program Infrastructure

- **TSI Career Accelerator** (fall): a 6-week intensive covering job search strategy, interview preparation (technical, behavioral, and case), salary negotiation, and professional brand development
- **Alumni Mentor Matching**: each senior is paired with a TSI alumni mentor working in their target field
- **Employer Partner Network**: the same organizations that sponsor capstones often recruit from the program, creating a natural hiring pipeline

- **On-Campus Recruiting**: TSI-specific recruiting events bring employers who specifically value the program's interdisciplinary profile

Typical Career Outcomes

TSI graduates enter a wide range of roles, including: - Technology strategy and consulting - Product management - Data strategy and analytics - Technology policy and regulation - UX research and design - Innovation management and corporate strategy - Public interest technology - Startup founding and venture development - Research and academia (via graduate school)

3.4.9 Graduate School Preparation

The TSI degree is intentionally designed to position students for a broad range of graduate programs. The interdisciplinary core and concentration depth create multiple pathways:

Computer Science (MS/PhD)

Students from the AI Governance and Policy or Product and Innovation Management concentrations graduate with substantial technical depth. TSI 212, TSI 311, and concentration courses provide the ML, systems, and programming foundations that CS graduate programs require. Students interested in this path should use their Technical Depth Electives for additional CS coursework (algorithms, systems, theory) and seek research experience with TSI or CS faculty. The TSI degree offers a distinctive advantage: applicants can articulate the societal significance of their research interests, which is increasingly valued in CS graduate admissions.

MBA Programs

TSI's business strand (TSI 140, TSI 240, TSI 340) provides direct preparation for MBA programs, and the capstone demonstrates the teamwork and strategic thinking that admissions committees seek. The Technology Strategy and Entrepreneurship concentration is particularly strong preparation. MBA programs increasingly seek applicants with technical literacy and a nuanced understanding of technology markets – exactly what TSI provides. Students typically benefit from 2-3 years of work experience before applying.

Public Policy (MPP/MPA)

The Ethics and Policy strand (TSI 130, TSI 230, TSI 330) combined with the AI Governance and Policy concentration provides rigorous preparation for policy graduate programs. Students can articulate technology policy positions with both technical precision and political awareness. The policy memo writing practiced in TSI 230 and TSI 330 directly mirrors MPP application and coursework expectations.

Human-Computer Interaction (MS/PhD)

The Human-Centered Technology Design concentration, combined with the Design and Leadership strand (TSI 120, TSI 220, TSI 250, TSI 350), provides the design research, user study, and interaction design foundations that HCI programs expect. The portfolio is particularly valuable for HCI applications, which typically require evidence of design process and user research capability.

Science, Technology, and Society (STS) (MS/PhD)

The TSI program's intellectual DNA draws heavily from STS traditions. The Systems and Society strand (TSI 101, TSI 210, TSI 310, TSI 410) provides the theoretical grounding in sociotechnical systems, actor-network theory, and complexity that STS graduate programs value. Students with strong analytical writing and a demonstrated capacity for critical analysis of technology are well-positioned for STS doctoral programs.

Law (JD)

The Ethics and Policy strand develops the analytical writing, argumentation, and policy reasoning skills that support strong LSAT performance and law school success. Students interested in technology law – intellectual property, data privacy, platform regulation, AI liability – bring a depth of technical understanding that most law school applicants lack. The TSI portfolio demonstrates the sustained analytical writing that law school admissions value.

Recommended Preparation for Graduate School

- Build relationships with faculty who can write specific, detailed recommendation letters
- Seek research experience (independent study, honors thesis option, or research assistantship)
- Present at undergraduate research conferences
- Use exploratory electives strategically to satisfy graduate program prerequisites
- Discuss graduate school plans with your advisor beginning in Year 3

4 Concentration Tracks

4.1 Overview

TSI students declare a concentration by the end of Year 2 (April deadline). Each concentration consists of **5 courses (15 credits)** that provide depth in a specific career-aligned domain while building on the shared core curriculum. Students may petition to complete a second concentration using exploratory electives.

All concentration courses are 3 credits and follow a progression from foundational to applied, culminating in a practicum or studio course that produces professional-quality portfolio artifacts.

4.2 Track 1: AI Governance and Policy

Target Careers

AI Ethics Officer, AI Policy Analyst, Responsible AI Manager, Governance Translator, Regulatory Affairs (AI/Technology), AI Auditor, Chief AI Officer (long-term)

Track Philosophy

This track prepares students to design, implement, and evaluate governance mechanisms for AI and other emerging technologies. It bridges the gap between technical understanding and regulatory/organizational governance — a combination almost no other undergraduate program offers. Graduates are uniquely positioned for the rapidly growing field of AI governance, where the IAPP reports median compensation of $152K and demand is accelerating as regulations like the EU AI Act move to enforcement.

Course Sequence

Course	Credits	Semester	Prerequisites
TSI 331 Algorithmic Auditing and Accountability	3	Year 3 Fall	TSI 212, TSI 230
TSI 332 Data Governance and Privacy Engineering	3	Year 3 Fall	TSI 212
TSI 431 AI Safety and Alignment	3	Year 3 Spring	TSI 330
TSI 432 Comparative Technology Governance	3	Year 4 Fall	TSI 230
TSI 433 Practicum in AI Governance	3	Year 4 Spring	TSI 330

Course Descriptions

TSI 331 — Algorithmic Auditing and Accountability (3 cr) Hands-on methods for auditing algorithmic systems for fairness, transparency, and compliance. Students learn disparate impact analysis, transparency audits, explainability assessments, and regulatory compliance verification. Using real datasets and deployed systems, students conduct full audit cycles and produce professional audit reports.

Covers both technical auditing and explainability tools (e.g., Fairlearn, SHAP, LIME) and organizational audit processes. Culminates in a team audit of a real algorithmic system with recommendations delivered to the system operator.

Learning Objectives: 1. **Conduct** a multi-method algorithmic audit using quantitative and qualitative techniques (Apply) 2. **Evaluate** AI system outputs for disparate impact across protected characteristics (Evaluate) 3. **Apply** explainability tools (SHAP, LIME, counterfactual explanations) to interpret model decisions (Apply) 4. **Produce** a professional algorithmic audit report with actionable recommendations (Create)

TSI 332 — Data Governance and Privacy Engineering (3 cr) The full data lifecycle from a governance perspective: data collection consent, storage and security, processing limitations, sharing restrictions, retention and deletion. Covers privacy-enhancing technologies (differential privacy, federated learning, synthetic data, homomorphic encryption concepts), data trusts and data cooperatives, data sovereignty, and compliance with GDPR, CCPA, HIPAA, and emerging data regulations. Students design a data governance framework for a realistic organizational scenario.

Learning Objectives: 1. **Analyze** data processing activities for compliance with major privacy regulations (Analyze) 2. **Evaluate** privacy-enhancing technologies for their suitability in specific contexts (Evaluate) 3. **Design** a data governance framework including policies, roles, technical controls, and audit procedures (Create) 4. **Assess** organizational data practices using Data Protection Impact Assessment (DPIA) methodology (Evaluate)

TSI 431 — AI Safety and Alignment (3 cr) Technical and philosophical foundations of AI safety. The alignment problem, interpretability research, robustness and adversarial attacks, safety engineering for AI systems, evaluation of frontier AI capabilities and risks. Covers current safety techniques (e.g., RLHF, constitutional AI, mechanistic interpretability — this rapidly evolving field is updated annually), red-teaming methodologies, safety cases, and the governance of frontier AI development. Students engage with primary research papers and develop a safety evaluation framework for a specific AI application domain.

Learning Objectives: 1. **Explain** the technical and philosophical dimensions of the AI alignment problem (Understand) 2. **Evaluate** current AI safety techniques (RLHF, interpretability, red-teaming) for their effectiveness and limitations (Evaluate) 3. **Design** a safety evaluation framework for a specific AI application domain (Create) 4. **Critique** proposed approaches to frontier AI governance using technical and policy reasoning (Evaluate)

TSI 432 — Comparative Technology Governance (3 cr) Cross-national comparison of technology governance regimes. Deep analysis of the US, EU, UK, China, Singapore, India, and Global South approaches to technology regulation. Topics include regulatory competition, Brussels effect, trade implications, digital sovereignty, standard-setting power, and the geopolitics of technology governance. Students produce a comparative policy analysis examining how different governance approaches affect innovation, rights, and equity.

Learning Objectives: 1. **Compare** technology governance approaches across at least four national/regional regimes (Analyze) 2. **Evaluate** the trade-offs between innovation promotion and rights protection in different regulatory models (Evaluate) 3. **Analyze** how geopolitical dynamics shape technology governance decisions (Analyze) 4. **Construct** a comparative policy analysis with recommendations for a specific governance challenge (Create)

TSI 433 — Practicum in AI Governance (3 cr) Applied project in partnership with a government agency, NGO, corporate responsible AI team, or AI safety organization. Students work in teams of 3-4 on a real governance challenge, producing professional deliverables such as governance frameworks, audit reports, policy recommendations, or compliance guides. Bi-weekly check-ins with the partner organization and faculty supervisor. This course bridges academic learning with professional AI governance practice.

Learning Objectives: 1. **Execute** a professional AI governance engagement from scoping through delivery (Create) 2. **Produce** governance deliverables that meet professional standards (Create) 3. **Navigate** organizational dynamics when implementing governance recommendations (Apply) 4. **Reflect** on the challenges and opportunities of AI governance practice (Evaluate)

Recommended Technical Depth Electives for This Track

- Cybersecurity Fundamentals
- Database Systems
- Probability and Statistics (advanced)

4.3 Track 2: Product and Innovation Management

Target Careers

Product Manager, Product Strategist, Innovation Manager, Technical Program Manager, Growth Strategist, Venture Capital Analyst, Product Marketing Manager

Track Philosophy

This track develops the full product management toolkit: discovery, strategy, execution, and growth. It bridges user research, technical understanding, business strategy, and data-driven decision making. Product management is one of the fastest-growing career paths in technology, with median salaries of $168K and over 26,000 openings weekly on LinkedIn. TSI's product track is unique in grounding product skills within a broader understanding of sociotechnical systems, ethics, and governance — producing PMs who build responsibly, not just effectively.

Course Sequence

Course	Credits	Semester	Prerequisites
TSI 341 Product Management Fundamentals	3	Year 3 Fall	TSI 240
TSI 342 User Research and Analytics	3	Year 3 Fall	TSI 120, TSI 211
TSI 441 Advanced Product Strategy	3	Year 3 Spring	TSI 341
TSI 442 Growth, Metrics, and Experimentation	3	Year 4 Fall	TSI 341, TSI 211

Course	Credits	Semester	Prerequisites
TSI 443 Product Studio	3	Year 4 Spring	TSI 441

Course Descriptions

TSI 341 — Product Management Fundamentals (3 cr) The product lifecycle from discovery to delivery. Product discovery techniques, opportunity assessment, roadmapping, prioritization frameworks (RICE, ICE, MoSCoW), PRD writing, sprint planning, cross-functional collaboration, stakeholder management, and industry PM tools (e.g., Jira, Linear, Productboard). Students shadow a working PM at a partner company and produce a product strategy document for a real product challenge.

Learning Objectives: 1. **Apply** product discovery techniques to identify and validate opportunities (Apply) 2. **Create** product roadmaps and PRDs using industry-standard frameworks (Create) 3. **Prioritize** feature backlogs using quantitative and qualitative methods (Analyze) 4. **Manage** a simulated product sprint cycle including cross-functional coordination (Apply)

TSI 342 — User Research and Analytics (3 cr) Qualitative and quantitative user research methods for product decisions. User interviews, contextual inquiry, surveys, diary studies, A/B testing, behavioral analytics, cohort analysis, funnel analysis, and jobs-to-be-done framework. Students learn to triangulate qualitative insights with quantitative data to drive product decisions. Hands-on work with analytics tools (e.g., Amplitude, Mixpanel) and survey platforms.

Learning Objectives: 1. **Design** and conduct qualitative user research studies (interviews, observations, diary studies) (Create) 2. **Analyze** quantitative behavioral data to identify usage patterns and opportunities (Analyze) 3. **Synthesize** qualitative and quantitative findings into actionable product insights (Evaluate) 4. **Present** research findings as compelling narratives that influence product decisions (Create)

TSI 441 — Advanced Product Strategy (3 cr) Product-market fit at scale, multi-product strategy, platform product management, AI-powered products, international product strategy, and managing products through technology transitions. Case studies of products that succeeded and failed at scaling. Students develop a comprehensive product strategy for a growth-stage product.

Learning Objectives: 1. **Evaluate** product-market fit using quantitative metrics and qualitative signals (Evaluate) 2. **Formulate** multi-product and platform strategies that create network effects (Create) 3. **Analyze** how AI capabilities change product strategy and user expectations (Analyze) 4. **Design** a product strategy for international expansion or technology transition (Create)

TSI 442 — Growth, Metrics, and Experimentation (3 cr) Growth frameworks, north star metrics, OKRs, experimentation design (A/B testing, multi-armed bandits), statistical significance, causal inference basics, growth modeling, and data-driven decision making. Students design and analyze experiments using real product data. Covers the tension between growth optimization and ethical product design.

Learning Objectives: 1. **Design** controlled experiments with appropriate statistical methodology (Create) 2. **Analyze** experiment results for statistical and practical significance (Analyze) 3. **Construct** growth models connecting product metrics to business outcomes (Create) 4. **Evaluate** the ethical implications of growth optimization techniques (Evaluate)

TSI 443 — Product Studio (3 cr) Teams work on a real product challenge from a sponsoring technology company over the full semester. From discovery through prototype delivery, students apply all product management skills in a professional context. Weekly mentorship from product leaders at the sponsoring company. Culminates in a product review presentation to the sponsor's product team.

Learning Objectives: 1. **Execute** a full product cycle from discovery to validated prototype (Create) 2. **Produce** professional-quality product deliverables (PRD, wireframes, prototype, metrics plan) (Create) 3. **Navigate** real stakeholder dynamics and technical constraints (Apply) 4. **Present** product recommendations with data-backed rationale to industry professionals (Evaluate)

Recommended Technical Depth Electives for This Track

- Database Systems
- Cloud Computing
- Software Engineering

4.4 Track 3: Human-Centered Technology Design

Target Careers

UX Researcher, UX/UI Designer, Service Designer, Design Strategist, Accessibility Specialist, Design Manager, Interaction Designer

Track Philosophy

This track develops advanced design skills that go beyond interface design to encompass service design, systems design, and design research. While UX roles experienced turbulence during recent tech layoffs, long-term demand remains strong (53% increase in openings 2018-2023), and the median experienced researcher earns $140K-$180K. TSI's design track is distinctive because graduates understand not just how to design but why design decisions matter at a systems level — integrating ethics, policy, and business strategy into design practice.

Course Sequence

Course	Credits	Semester	Prerequisites
TSI 321 Interaction Design and Prototyping	3	Year 3 Fall	TSI 120
TSI 322 Inclusive and Accessible Design	3	Year 3 Fall	TSI 120
TSI 421 Design Research Methods	3	Year 3 Spring	TSI 321
TSI 422 Service and Systems Design	3	Year 4 Fall	TSI 321
TSI 423 Design Studio	3	Year 4 Spring	TSI 421

Course Descriptions

TSI 321 — Interaction Design and Prototyping (3 cr) Advanced prototyping beyond the basics of TSI 120. High-fidelity design in industry-standard tools (currently Figma and Framer), interaction patterns, micro-interactions, motion design, design systems and component libraries, responsive design, and designing for multiple platforms (web, mobile, wearables). Students build a design system for a realistic product scenario and produce portfolio-quality interaction designs.

Learning Objectives: 1. **Create** high-fidelity interactive prototypes using industry-standard tools (Figma, Framer) (Create) 2. **Design** coherent design systems with reusable components and design tokens (Create) 3. **Apply** interaction design principles (feedback, affordance, mapping, consistency) to complex interfaces (Apply) 4. **Evaluate** interaction designs through heuristic evaluation and expert review (Evaluate)

TSI 322 — Inclusive and Accessible Design (3 cr) Designing for diverse abilities, ages, cultures, and contexts. WCAG 2.2 standards, assistive technologies (screen readers, switch access, voice control), universal design principles, co-design with marginalized communities, cultural considerations in design, and designing for emerging markets. Students conduct accessibility audits and redesign an existing product for greater inclusion.

Learning Objectives: 1. **Evaluate** digital products against WCAG 2.2 accessibility standards (Evaluate) 2. **Design** inclusive solutions through co-design methods with diverse user groups (Create) 3. **Apply** universal design principles to create products usable by the widest possible audience (Apply) 4. **Analyze** how cultural context shapes technology use and design requirements (Analyze)

TSI 421 — Design Research Methods (3 cr) Advanced research methods beyond the introduction in TSI 120. Diary studies, longitudinal research, participatory design, ethnographic methods, mixed methods research design, research operations and scaling research practice, and research ethics. Students design and execute a multi-method research study and produce a professional research report.

Learning Objectives: 1. **Design** multi-method research studies combining qualitative and quantitative approaches (Create) 2. **Conduct** advanced qualitative research (ethnography, diary studies, participatory design) (Apply) 3. **Synthesize** complex research findings into strategic design recommendations (Evaluate) 4. **Evaluate** research quality using validity, reliability, and ethical criteria (Evaluate)

TSI 422 — Service and Systems Design (3 cr) Designing beyond screens. Service blueprints, ecosystem maps, organizational design, policy design, and systemic design. How to design interventions at the systems level — addressing not just user interfaces but the organizational structures, policies, and processes that surround them. Students work on a service design challenge with a real organization.

Learning Objectives: 1. **Map** complex service ecosystems using service blueprints and ecosystem maps (Apply) 2. **Design** service interventions that address systemic rather than surface-level problems (Create) 3. **Analyze** how organizational structures and policies shape user experiences (Analyze) 4. **Evaluate** service design proposals for feasibility, desirability, and viability (Evaluate)

TSI 423 — Design Studio (3 cr) Intensive studio course where students build a portfolio-quality design project from research through high-fidelity deliverable. Students choose a design challenge, conduct primary research, iterate through multiple design cycles, and produce a comprehensive case study suitable for professional portfolios. Weekly critiques with faculty and visiting design professionals.

Learning Objectives: 1. **Execute** a complete design process from research through final deliverable (Create) 2. **Produce** portfolio-quality design work demonstrating mastery of research, ideation, and craft (Create) 3. **Articulate** design decisions through compelling case study narratives (Evaluate) 4. **Incorporate** critique and feedback into iterative design improvement (Apply)

Recommended Technical Depth Electives for This Track

- Computer Graphics / Visualization
- Cognitive Science / Psychology of Perception
- Front-End Web Development

4.1.5 Track 4: Technology Strategy and Entrepreneurship

Target Careers

Strategy Consultant (McKinsey, BCG, Bain, Deloitte, Accenture), Corporate Strategist, Startup Founder, Business Development Manager, Technology Investment Analyst, Digital Transformation Leader, Chief Digital Officer (long-term)

Track Philosophy

This track develops the strategic thinking and execution skills needed to lead technology-driven organizations and ventures. It combines analytical rigor with entrepreneurial action — students both analyze strategy and create it. The career paths here are among the highest-compensated: technology strategy consultants ($150K-$250K mid-career), digital transformation leaders ($222K+), and venture capital professionals ($200K+ mid-career). TSI's strategy track is distinctive in its integration of technical understanding and ethical reasoning into strategic decision-making.

Course Sequence

Course	Credits	Semester	Prerequisites
TSI 343 Venture Creation and Startup Finance	3	Year 3 Fall	TSI 240
TSI 344 Digital Transformation Management	3	Year 3 Fall	TSI 210, TSI 240
TSI 444 Technology M&A and Investment	3	Year 3 Spring	TSI 340
TSI 445 Scaling Technology Ventures	3	Year 4 Fall	TSI 343
TSI 446 Strategy Practicum	3	Year 4 Spring	TSI 340

Course Descriptions

TSI 343 — Venture Creation and Startup Finance (3 cr) From idea to funded venture. Customer discovery methodology, minimum viable product (MVP) development, pitch deck construction, term sheets, cap tables, equity structure, fundraising strategy (pre-seed through Series A), and startup legal basics. Students work in teams to develop and pitch a real venture concept through a simulated investor review process. Includes visits from founders and VCs.

Learning Objectives: 1. **Apply** customer discovery methodology to validate a business concept (Apply) 2. **Construct** a comprehensive pitch deck and financial model for a technology venture (Create) 3. **Analyze** term sheets and funding structures for their implications on founders and investors (Analyze) 4. **Evaluate** venture opportunities using investor frameworks (market size, team, traction, defensibility) (Evaluate)

TSI 344 — Digital Transformation Management (3 cr) Leading digital transformation in established organizations. Change management frameworks, legacy system modernization, cultural transformation, building digital capabilities, governance of digital programs, measuring transformation success, and managing resistance. Case studies of both successful and failed transformations. Students develop a digital transformation roadmap for a real organization.

Learning Objectives: 1. **Assess** organizational digital maturity using structured assessment frameworks (Evaluate) 2. **Design** a digital transformation roadmap addressing technology, process, people, and governance (Create) 3. **Analyze** organizational barriers to technology adoption and design mitigation strategies (Analyze) 4. **Evaluate** change management approaches for technology transformation contexts (Evaluate)

TSI 444 — Technology Mergers, Acquisitions, and Investment (3 cr) Technology M&A from both the acquirer and target perspectives. Deal sourcing, due diligence (technical, financial, cultural), valuation methods for technology companies (DCF, comparables, venture method), integration planning and execution, and post-merger technology rationalization. Also covers venture capital and private equity perspectives on technology investment. Students analyze a real M&A transaction and evaluate a technology investment opportunity.

Learning Objectives: 1. **Conduct** technology due diligence covering technical architecture, team, IP, and risks (Apply) 2. **Apply** multiple valuation methods to technology companies and assess their limitations (Apply) 3. **Design** a post-merger integration plan for technology, product, and team (Create) 4. **Evaluate** technology investment opportunities using multi-criteria frameworks (Evaluate)

TSI 445 — Scaling Technology Ventures (3 cr) The unique challenges of scaling: go-to-market at scale, organizational design for growth stages, international expansion, managing through hyper-growth, building and leading distributed teams, scaling culture, and navigating the transition from startup to scale-up. Case studies of companies at different growth stages. Students analyze scaling challenges of a real growth-stage company.

Learning Objectives: 1. **Analyze** the operational, organizational, and cultural challenges of scaling technology companies (Analyze) 2. **Design** go-to-market strategies appropriate for different growth stages (Create) 3. **Evaluate** organizational structures and management practices for scaling effectiveness (Evaluate) 4. **Formulate** recommendations for a growth-stage company facing specific scaling challenges (Create)

TSI 446 — Strategy Practicum (3 cr) Teams of 3-4 serve as strategy consultants to a real client organization over the full semester. Typical engagements include technology strategy assessments, market entry analyses, competitive positioning studies, or innovation portfolio reviews. Students follow a professional consulting engagement model: scoping, research, analysis, synthesis, and final presentation. Deliverables include a strategy deck, executive summary, and implementation roadmap.

Learning Objectives: 1. **Execute** a professional strategy consulting engagement from scoping through delivery (Create) 2. **Produce** C-suite-ready strategy deliverables (analysis, recommendations, implementation plan) (Create) 3. **Synthesize** quantitative and qualitative analysis into compelling strategic narratives (Evaluate) 4. **Present** strategic recommendations persuasively to senior organizational leaders (Apply)

Recommended Technical Depth Electives for This Track

- Cloud Computing / Distributed Systems
- Financial Engineering / Quantitative Methods
- Operations Research / Optimization

4.6 Cross-Track Opportunities

Students pursuing a **double concentration** can do so by using their 9 exploratory elective credits toward a second track's courses (requires 6 additional credits, typically taken as overloads or summer courses). Common pairings: - AI Governance + Product Management (for responsible product leadership) - Human-Centered Design + Product Management (for design-led product roles) - Technology Strategy + AI Governance (for technology investment with governance expertise)

Students who do not wish to pursue a full second concentration may take **individual courses from other tracks** as exploratory electives to broaden their skills.

4.7 Concentration Declaration Process

1. **Year 1:** Students are exposed to all five thematic strands through core courses; informal concentration exploration through advising
2. **Year 2 Fall:** Concentration exploration events — panels with faculty from each track, conversations with upper-class students, industry speakers aligned to each track
3. **Year 2 February:** Non-binding concentration intent form submitted to advisor
4. **Year 2 April:** Formal concentration declaration due; students submit a brief statement explaining their choice and how it connects to their career goals
5. **Flexibility:** Students may petition to change concentration through the first month of Year 3 Fall semester with advisor approval

5 Core Course Syllabi

The TSI core curriculum comprises 18 courses and 2 capstone courses organized across five thematic strands. Detailed syllabi for all 18 courses are provided in Annex A. The core courses are:

- **TSI 101** — Introduction to Sociotechnical Systems
  Introduction to technology as embedded in social, organizational, political, and economic systems. Students explore how technologies emerge, stabilize, and transform society through theoretical frameworks including Actor-Network Theory, Social Construction of Technology, and Large Technical Systems. Case studies range from the printing press to generative AI. Students develop systems mapping skills and construct a Technology Autobiography connecting personal experience to broader sociotechnical dynamics.
- **TSI 110** — Computational Thinking and Programming
  Introduction to computational thinking and Python programming for future technology leaders. Students develop fluency in decomposition, pattern recognition, abstraction, and algorithmic design while learning to write Python programs that manipulate data, automate tasks, and solve real-world problems. The course covers data manipulation and visualization with industry-standard Python libraries, version control with Git, and AI-augmented development — using AI coding assistants as development partners while building the judgment to evaluate and debug AI-generated code. No prior programming experience required.
- **TSI 120** — Human-Centered Design Thinking
  Introduction to human-centered design thinking methodology through the full design cycle: empathize, define, ideate, prototype, and test. Student teams tackle a real design challenge sourced from a community or industry partner, progressing from user research through iterative prototyping to a final design presentation. Emphasis on empathy-driven research, inclusive design, and communicating design rationale to diverse audiences. Students develop skills in interviewing, synthesis, rapid prototyping (paper and digital), and usability testing.
- **TSI 130** — Ethics of Technology
  Systematic examination of ethical frameworks applied to technology design, deployment, and governance. Students engage with utilitarian, deontological, virtue ethics, care ethics, and justice-based approaches to analyze pressing technology controversies including privacy and surveillance, algorithmic fairness, autonomy and manipulation, labor displacement, and data ethics. Through structured debates, case analyses, and an extended ethics position paper, students develop the capacity to construct rigorous, evidence-based ethical arguments about current and emerging technology issues.
- **TSI 140** — Business Fundamentals for Technologists
  Rapid survey of core business concepts designed for the tech-business intersection. Students develop financial literacy, marketing fundamentals, organizational behavior awareness, operations understanding, and economics of technology markets. The course uses technology company cases throughout, ensuring that every business concept is grounded in the contexts students will encounter as technology professionals. Students culminate the course by constructing a business model canvas and pitch for a technology venture.

- **TSI 210** — Technology and Organizational Change
  Examines how organizations adopt, resist, and transform through technology. Students engage with organizational theory, change management frameworks, institutional dynamics, and technology adoption models. Through case studies of successful and failed technology implementations, students learn to diagnose organizational readiness, design change strategies, and evaluate the interplay of culture, incentives, and technical systems. Emphasis on applying theoretical models to real organizational contexts through simulation exercises and case analysis.
- **TSI 211** — Data Science for Decision Making
  Applied data science for technology-oriented decision makers. Students develop skills in exploratory data analysis, statistical inference, regression, A/B testing, and data visualization using Python and standard data science libraries. Emphasis on interpreting results, communicating insights to non-technical audiences, and making evidence-based decisions rather than purely technical execution. Students complete a semester-long data analysis project culminating in a decision brief and interactive dashboard.
- **TSI 212** — AI and Machine Learning Foundations
  Conceptual and practical introduction to AI and machine learning designed for future technology leaders. Students learn how AI models work, gain hands-on experience training and evaluating models, and develop judgment about when and how AI should be deployed. The second half extends into modern AI application patterns — large language models, agentic systems, and AI composition via APIs. The course emphasizes intuition, evaluation, and practical application over mathematical derivation. Students work with real datasets using standard ML libraries, while also engaging critically with questions of fairness, bias, and organizational readiness for AI adoption.
- **TSI 220** — Design and Prototyping for Technology Leaders
  Intermediate design and prototyping course bridging foundational design thinking (TSI 120) and concentration-level design specialization. Students develop digital prototyping skills using Figma, learn interaction design and information architecture principles, and practice structured usability evaluation. Topics include responsive design, designing for AI-powered interfaces, design systems, accessibility foundations, service design, and ethical considerations including dark patterns and persuasive design. A semester-long team project requires students to redesign an existing digital product or service through the full design process from research through high-fidelity prototype with usability validation.
- **TSI 230** — Technology Policy and Regulation
  Examination of how governments and industry regulate technology across domains including AI, data protection, cybersecurity, biotechnology, and climate technology. Students study the policymaking process, analyze major regulatory frameworks, and develop skills in policy analysis and advocacy. The course features policy simulations where students represent diverse stakeholders — legislators, regulators, industry executives, civil society advocates — and guest appearances by practicing policymakers. Students produce a substantive policy brief as a portfolio artifact.
- **TSI 240** — Innovation and Entrepreneurship
  Innovation theory and entrepreneurial practice in both startup and corporate contexts. Students move from idea generation through customer discovery, lean startup methodology, MVP

development, and business model iteration. Covers innovation theory (Schumpeter, Christensen), the jobs-to-be-done framework, design sprints, intellectual property basics, and innovation portfolio management. Teams develop and pitch a technology venture concept through iterative customer validation cycles.

- **TSI 250** — Leadership in Technical Organizations
  Develops the leadership capabilities essential for technology professionals operating in complex, ambiguous, and rapidly changing environments. Students study adaptive leadership, facilitation, negotiation, conflict resolution, psychological safety, and leading through uncertainty. The course is heavily experiential, featuring simulations, role-plays, coached feedback sessions, and a 360-degree assessment. Students synthesize their growth into a personal leadership development plan that serves as a portfolio artifact.
- **TSI 310** — Complex Adaptive Systems
  Advanced systems thinking for technology leaders. Students engage with complexity theory, network science, agent-based modeling, emergence, and resilience as applied to technology ecosystems, organizational dynamics, and societal technology transitions. Building on foundations from TSI 101 and TSI 210, this course develops sophisticated analytical capabilities through computational modeling. Students build agent-based and network models to explore emergent phenomena in sociotechnical systems, culminating in a research-quality systems analysis.
- **TSI 311** — Building Intelligent Systems
  Hands-on, project-intensive course in which students design, orchestrate, and deploy AI-native systems. Building on the foundations of TSI 212, this course teaches students to compose AI capabilities into complete systems that solve real problems — the transition from understanding individual models to architecting multi-component intelligent applications. Students work through four month-long project cycles covering AI-powered application design, agentic AI systems, human-AI interaction patterns, and system reliability. Specific tools and frameworks are updated annually to reflect the rapidly evolving landscape; the emphasis is on durable design principles and engineering discipline rather than mastery of any particular platform.
- **TSI 330** — AI Governance and Responsible Innovation
  The signature course of the B.S. in Technology, Society, and Innovation program. Students operate at the advanced intersection of AI technical knowledge and governance practice, learning to design, implement, and evaluate AI governance mechanisms for real organizations. Topics include risk assessments, algorithmic impact assessments, audit frameworks, transparency mechanisms, and accountability structures. Students produce professional-grade governance artifacts — including a complete algorithmic impact assessment and a comprehensive AI governance program — that demonstrate mastery of the program's distinctive integration of technical fluency, policy literacy, and ethical reasoning. The course draws on frameworks from NIST, ISO, and the EU AI Act while engaging critically with their strengths, limitations, and evolving applicability.
- **TSI 340** — Technology Strategy and Business Models
  Advanced course in technology strategy examining how firms create and capture value through technology. Students analyze platform strategy, ecosystem dynamics, digital transformation, technology adoption and diffusion, standards competition, and strategy formulation under deep

uncertainty. The course employs the case method extensively, drawing on cases from Harvard Business School, Kellogg, and Stanford, supplemented by strategy workshops where students apply frameworks to live strategic challenges. Industry mentors participate in selected sessions and provide feedback on the final strategy project, in which student teams develop a comprehensive technology strategy for a real organization.

- **TSI 350** — Applied Leadership Practicum
  Applied leadership development through a semester-long consulting engagement with a real nonprofit, startup, or community organization facing a technology challenge. Students work in teams of four to five, rotating through the team lead role across project phases. Where TSI 250 focuses on leadership theory and self-awareness, this course develops applied leadership capabilities: consulting skills, leading through influence, managing cross-cultural teams, navigating stakeholder conflict, and presenting to non-expert audiences. A professional leadership coach provides individual and team coaching sessions throughout the semester.
- **TSI 410** — Technology Futures and Foresight
  Capstone-level course in foresight and futures thinking for technology leaders. Students learn and apply systematic methods for anticipating technological change and its societal implications, including horizon scanning, scenario planning, Three Horizons Framework, technology roadmapping, Wardley Mapping, backcasting, and causal layered analysis. The course develops futures literacy — the capacity to think rigorously about uncertainty, possibility, and long-term consequence — as an essential competency for responsible technology leadership. Students produce a comprehensive foresight report on an emerging technology domain, integrating multiple methodologies and demonstrating the ability to synthesize technical, social, economic, and political signals into actionable strategic insight
- **TSI 491/492** — Senior Capstone I and II
  Year-long team-based capstone experience in which teams of 4-5 students address a real sociotechnical challenge posed by an industry, nonprofit, or government sponsor. The capstone requires integration of all program dimensions — sociotechnical systems thinking, technical fluency, design, policy, ethics, strategy, and communication — into a coherent project that produces a working artifact of professional quality. TSI 491 (Fall) focuses on problem definition, research, methodology design, and project planning. TSI 492 (Spring) focuses on execution, validation, iteration, and delivery of the final artifact and comprehensive portfolio. The capstone culminates in a public showcase and defense, sponsor handoff, and submission of the student's comprehensive program portfolio.

6 Career Pathways

6.1 Overview

The B.S. in Technology, Society, and Innovation prepares graduates for a diverse set of career pathways at the intersection of technology, business, and society. Unlike programs that funnel graduates into a single career track, TSI's interdisciplinary design opens multiple doors — and the concentration system allows students to develop depth in their preferred direction.

This document maps career pathways to specific program elements, salary data, employer types, and growth projections. All salary data is based on 2024-2025 market research from BLS, Glassdoor, Levels.fyi, IAPP, and industry compensation surveys.

A note on salary ranges: Salary ranges represent market rates for these roles across all educational backgrounds. Actual starting salaries for TSI graduates will depend on company size, location, internship experience, and portfolio quality. Ranges shown are for major metro areas (New York, San Francisco, Seattle, Boston, Washington D.C.); adjust downward 15-25% for smaller markets. The high end of entry-level ranges typically reflects top-tier tech companies and financial centers; most graduates should calibrate expectations to the middle of the range.

6.2 Career Timeline: What to Expect and When

TSI graduates will not step into executive roles on day one. Career development follows a predictable arc, and it is important to be honest about what is accessible immediately versus what requires years of experience.

Entry-Level Accessible (0-2 Years Post-Graduation)

These are roles TSI graduates can realistically compete for upon graduation with strong internship experience and a solid portfolio:

Role	Typical Salary	Primary Concentration
Associate Product Manager (APM)	$85K-$115K	Product & Innovation
AI Governance Analyst	$75K-$100K	AI Governance
UX Researcher (Junior)	$70K-$95K	Human-Centered Design
Junior Consultant / Analyst	$75K-$105K	Tech Strategy
Digital Transformation Associate	$80K-$110K	Tech Strategy
Data Analyst	$70K-$95K	Any + Technical Depth
Policy Research Assistant	$55K-$75K	AI Governance
Technology Communications Associate	$50K-$70K	Any

Mid-Career Development (3-7 Years)

These roles require demonstrated professional experience and typically some combination of strong performance reviews, expanded scope, and possibly additional credentials:

Role	Typical Salary	Path From
Senior Product Manager	$140K-$185K	APM track
AI Governance Lead / Manager	$125K-$170K	AI Governance Analyst
Strategy Manager / Senior Consultant	$140K-$230K	Junior Consultant
Design Lead / Senior UX Researcher	$115K-$155K	Junior UX
Analytics Manager / Data Strategy Lead	$125K-$165K	Data Analyst
Program Director, Digital Transformation	$150K-$230K	Digital Transformation Associate
Senior Policy Analyst	$90K-$130K	Policy Research Assistant

Long-Term Leadership (8+ Years)

These roles require significant career development, leadership track records, and often additional education or credentials. They represent aspirational trajectories, not guaranteed outcomes:

Role	Typical Salary	Notes
VP of Product / Chief Product Officer	$200K-$350K+	Requires 10+ years of progressive PM leadership
Director/VP of AI Governance	$180K-$300K+	Field is new; early movers have advantage
Partner at Consulting Firm	$300K-$600K+	Highly selective; requires exceptional client development
Chief Digital Officer	$250K-$400K+	Requires enterprise transformation track record
Chief AI Officer	$200K-$400K+	Emerging role; combines AI governance + strategy + leadership
VP of Design / Head of Research	$170K-$250K+	Requires deep portfolio and team leadership

On the Chief AI Officer role: This title is rapidly emerging as organizations build dedicated AI leadership. It is not an entry-level or even mid-career role. TSI graduates who pursue the AI Governance concentration and gain 10+ years of progressive experience in AI governance, product, or strategy are well-positioned as this role matures. The combination of technical understanding, policy expertise, and strategic leadership that TSI develops maps directly to what organizations are seeking — but the path requires patience and deliberate career development.

6.3 What This Degree Is and Is Not For

TSI is designed to produce technology leaders, strategists, and governance professionals — people who lead the teams that build, deploy, and govern technology. Being clear about what TSI does and does not prepare you for is a sign of program confidence, not weakness.

TSI graduates are strongly competitive for:

- Product management and technology strategy roles
- AI governance, responsible AI, and technology policy positions
- UX research and design strategy roles
- Technology consulting and digital transformation
- Data strategy and analytics (business-facing, not infrastructure)
- Startup founding (especially with 2-5 years of industry experience first)
- Technology communications and science writing

TSI is NOT designed to prepare graduates for:

- **Software engineering roles.** TSI teaches enough programming to prototype, analyze data, and communicate with engineering teams — but software engineering positions at major companies require the depth of a CS degree. Students who discover a passion for engineering during TSI should consider a CS minor or post-graduation bootcamp/MS.
- **Data science and ML engineering roles.** TSI covers data analysis and machine learning concepts, but production ML engineering requires deeper mathematics (linear algebra, optimization theory) and CS infrastructure skills. An MS in Data Science or CS after TSI can bridge this gap.
- **Pure visual/interaction design roles at design-first agencies.** TSI's design track emphasizes research and strategy. Graduates competing for roles at agencies like Pentagram or IDEO's design teams will need a strong independent portfolio beyond coursework. (Note: UX research roles at these firms are a strong fit.)
- **Quantitative finance roles.** Algorithmic trading, quantitative analysis, and financial engineering require dedicated mathematics and finance training.
- **Entry-level policy analyst roles at top-tier think tanks.** Positions at Brookings, RAND, or similar institutions typically expect an MPP or related graduate degree. TSI provides excellent

preparation for these graduate programs, and graduates can pursue research assistant roles as a stepping stone.

These boundaries define the degree's focus. TSI graduates know what they are — and what they are not — which is itself a professional strength.

6.4 Career Pathway Matrix

Pathway	Entry Salary	Mid-Career Salary	Growth Outlook	Primary Concentration	Key Courses
Product Manager	$85K-$115K	$140K-$185K	Strong	Product & Innovation	TSI 341, 342, 441, 442, 443
AI Governance Specialist	$75K-$100K	$125K-$170K	Explosive	AI Governance	TSI 330, 331, 332, 431, 433
UX Researcher/Designer	$70K-$95K	$115K-$155K	Stable-Growing	Human-Centered Design	TSI 120, 321, 322, 421, 423
Technology Strategy Consultant	$75K-$105K	$140K-$230K	Strong	Tech Strategy	TSI 340, 344, 444, 446
Digital Transformation Leader	$80K-$110K	$150K-$230K	Explosive	Tech Strategy	TSI 210, 340, 344, 445
Startup Founder	Varies	Varies	Always	Tech Strategy + Product	TSI 240, 343, 445, Capstone
Data Strategy/Analytics	$70K-$95K	$125K-$165K	Strong	Any + Tech Depth	TSI 211, 212, 311, Tech electives
Technology Policy Analyst	$55K-$75K	$90K-$130K	Growing	AI Governance	TSI 230, 330, 432, 433
Responsible AI / AI Safety	$85K-$120K	$140K-$190K	Explosive	AI Governance	TSI 330, 331, 431, 433
Science/Tech Communication	$50K-$70K	$75K-$115K	Stable	Any	Communication portfolio
VC / Tech Investment	$80K-$110K	$200K+	Competitive	Tech Strategy	TSI 340, 444, 343

6.5 Detailed Pathway Descriptions

1. Product Manager

What They Do: Product managers are the connective tissue of technology organizations — they define what gets built, for whom, and why. They synthesize user needs, business objectives, and technical constraints into product strategy and execution.

Why TSI Graduates Excel: TSI graduates bring a uniquely broad perspective to product management. While most PMs come from pure CS or pure business backgrounds, TSI graduates understand sociotechnical systems, can reason about ethical implications, and have practical experience with design thinking, data analysis, and business strategy. The program's emphasis on cross-functional leadership (TSI 250) and communication directly addresses the #1 skill employers seek in PMs.

Entry Roles: Associate Product Manager, Product Analyst, Junior PM **Mid-Career Roles:** Senior Product Manager, Group PM, Director of Product **Senior Roles:** VP of Product, Chief Product Officer

Salary Progression: - Entry (0-2 years): $85K-$115K - Mid (3-7 years): $140K-$185K - Senior (8+ years): $200K-$300K+

Typical Employers: Google, Meta, Amazon, Microsoft, Salesforce, Stripe, mid-stage startups, SaaS companies

Key PLOs Demonstrated: PLO-2 (design), PLO-4 (strategy), PLO-5 (technical), PLO-6 (communication), PLO-7 (leadership)

Graduate School Guidance: A graduate degree is not needed for product management careers. An MBA can accelerate progression to Director/VP level but is optional and best pursued after 3-5 years of PM experience. Some PMs pursue part-time MBA programs while working.

Preparation Path: Core curriculum + Product & Innovation Management concentration + technical depth electives in software engineering or cloud computing + internship at a technology company

2. AI Governance and Ethics Specialist

What They Do: AI governance specialists design and implement the policies, processes, and technical safeguards that ensure AI systems are developed and deployed responsibly. They bridge technical teams, legal/compliance, and organizational leadership.

Why TSI Graduates Excel: This is TSI's signature career pathway. The combination of AI technical knowledge (TSI 212, 311), ethics training (TSI 130, 330), and policy expertise (TSI 230, 432) produces graduates uniquely qualified for a field that barely existed five years ago. Industry surveys indicate that a majority of AI governance professionals come from compliance, legal, or IT backgrounds — TSI graduates arrive with integrated expertise across all these domains.

Emerging Specialization — AI Systems Architecture: As AI systems evolve from standalone models toward complex multi-agent architectures with tool use, orchestration layers, and autonomous capabilities, a new specialization is emerging at the intersection of AI governance and system design. Professionals who understand both the technical architecture of AI systems and the governance frameworks that constrain them are in growing demand. TSI's AI Governance concentration, combined with technical depth from TSI 311, provides a foundation for this evolving role. The specific techniques (currently including retrieval-augmented generation, agentic workflows, and context engineering) will continue to evolve, but the need for professionals who bridge technical and governance perspectives is durable.

Entry Roles: AI Governance Analyst, Responsible AI Associate, AI Ethics Researcher, Privacy Analyst **Mid-Career Roles:** AI Governance Manager, Responsible AI Lead, AI Policy Director **Senior Roles:** Chief AI Ethics Officer, Head of Responsible AI, VP of AI Governance

Salary Progression: - Entry (0-2 years): $75K-$100K - Mid (3-7 years): $125K-$170K - Senior (8+ years): $180K-$300K+

Typical Employers: Google DeepMind, Microsoft, OpenAI, Anthropic, Meta, government agencies (NIST, FTC, OSTP), think tanks (Brookings, RAND, AI Now), consulting firms (Deloitte, PwC, EY AI governance practices), non-profits (Partnership on AI, OECD AI Policy Observatory)

Key PLOs Demonstrated: PLO-3 (governance/ethics), PLO-5 (technical), PLO-8 (technology assessment), PLO-1 (systems thinking)

Relevant Certifications: IAPP AI Governance Professional (AIGP), ISACA AI Audit, GARP Responsible AI

Graduate School Guidance: Helpful but optional. A J.D. accelerates career progression for those interested in the legal and regulatory dimensions of AI governance. An MPP is valuable for those targeting government or think tank roles. Neither is required for corporate AI governance positions, where demonstrated expertise and certifications carry significant weight.

Preparation Path: Core curriculum + AI Governance and Policy concentration + technical depth in cybersecurity or database systems + internship at AI company, government agency, or policy organization

3. UX Researcher / Designer

What They Do: UX professionals ensure that technology products and services meet real human needs through research, design, and testing. UX researchers study user behavior and needs; UX designers translate those insights into effective interfaces and experiences.

Why TSI Graduates Excel: TSI's design track (built on TSI 120 foundations) goes beyond interface design to encompass service design, systems design, and inclusive design. Graduates understand not just how to design usable products but how design decisions connect to organizational strategy, ethical considerations, and policy implications — producing "design strategists" rather than just visual designers.

Entry Roles: Junior UX Researcher, UX Designer, Product Designer, Design Researcher **Mid-Career Roles:** Senior UX Researcher, Lead Designer, Design Manager **Senior Roles:** Director of Design, VP of Design, Head of Research

Salary Progression: - Entry (0-2 years): $70K-$95K - Mid (3-7 years): $115K-$155K - Senior (8+ years): $170K-$250K+

Typical Employers: Design agencies (IDEO, frog, Fjord), tech companies (all major), healthcare technology, financial technology, consulting firms with design practices

Key PLOs Demonstrated: PLO-2 (design), PLO-6 (communication), PLO-1 (systems thinking), PLO-7 (team leadership)

Graduate School Guidance: Helpful but optional. An M.S. in Human-Computer Interaction (HCI) deepens research methodology and opens doors to senior research roles and academic positions. Not needed for industry UX roles, where portfolio quality matters more than credentials. Programs at Carnegie Mellon, Georgia Tech, University of Washington, and Michigan are particularly strong.

Preparation Path: Core curriculum + Human-Centered Technology Design concentration + portfolio development through TSI 423 Design Studio + internship at design-forward company

4. Technology Strategy Consultant

What They Do: Technology strategy consultants advise organizations on how to leverage technology for competitive advantage, navigate digital transformation, and make strategic technology investment decisions. They work at the intersection of business strategy and technology capability.

Why TSI Graduates Excel: The consulting path values "T-shaped" professionals — exactly what TSI produces. Graduates can credibly engage with technical teams, analyze business models, consider ethical and regulatory implications, and communicate strategic recommendations to C-suite audiences. The strategy track's case-method training (TSI 340) and practicum (TSI 446) provide direct preparation for consulting work.

Entry Roles: Analyst, Associate Consultant, Business Technology Analyst **Mid-Career Roles:** Consultant, Senior Consultant, Manager, Engagement Manager **Senior Roles:** Principal, Partner, Managing Director

Salary Progression: - Entry (0-2 years): $75K-$105K - Mid (5-8 years): $140K-$230K - Senior (10+ years): $300K-$600K+ (Partner level)

Typical Employers: McKinsey (Digital), BCG (X, Gamma), Bain, Deloitte Digital, Accenture, Capgemini, boutique technology strategy firms

Key PLOs Demonstrated: PLO-4 (strategy), PLO-1 (systems thinking), PLO-6 (communication), PLO-8 (technology assessment)

Graduate School Guidance: Not needed for entry or early career. An MBA from a top program is helpful for accelerating to Partner-level at elite firms (McKinsey, BCG, Bain) but is typically pursued after 3-5 years of consulting experience, often employer-sponsored. Many successful consultants reach Partner without an MBA.

Preparation Path: Core curriculum + Technology Strategy and Entrepreneurship concentration + strong quantitative technical depth electives + case competition experience + consulting-focused internship

5. Digital Transformation Leader

What They Do: Digital transformation leaders guide organizations through large-scale technology adoption and organizational change. They translate strategic vision into execution, managing the complex interplay of technology, processes, people, and culture.

Why TSI Graduates Excel: TSI's unique combination of organizational change theory (TSI 210), strategy (TSI 340), leadership (TSI 250), and technical understanding positions graduates for a field where 70% of organizations cite "program leadership" as their biggest success factor. TSI graduates understand both the technology and the human dynamics of transformation.

Entry Roles: Digital Adoption Manager, Digital Innovation Analyst, Agile Transformation Associate **Mid-Career Roles:** Digital Transformation Manager, Program Director, Head of Digital **Senior Roles:** Chief Digital Officer, SVP Digital Strategy

Salary Progression: - Entry (0-2 years): $80K-$110K - Mid (5-8 years): $150K-$230K - Senior (10+ years): $250K-$400K+

Typical Employers: Enterprise companies (Fortune 500), consulting firms, healthcare systems, financial institutions, government agencies undergoing modernization

Key PLOs Demonstrated: PLO-1 (systems), PLO-4 (strategy), PLO-7 (leadership), PLO-8 (technology assessment)

Graduate School Guidance: Not needed. Digital transformation is a practitioner-driven field where experience and results matter more than credentials. An MBA or executive education can help at the SVP/CDO level but is rarely a prerequisite.

6. Startup Founder / Technology Entrepreneur

What They Do: Founders create new technology companies that solve real problems. They combine technical vision with business execution, team building, and fundraising.

Why TSI Graduates Excel: TSI's entrepreneurship coursework (TSI 240, 343, 445) provides practical startup skills, while the broader curriculum ensures founders think about ethics, governance, and societal impact from the start. The capstone experience simulates many aspects of early venture building. The program's network of industry partners and advisory board members provides early connections to the startup ecosystem.

Salary/Outcome: Highly variable — ranges from zero (early-stage) to exceptional (successful exit). 82% of successful founders have a college degree, and interdisciplinary training correlates with more successful venture outcomes.

Typical Path: Many TSI graduates will work 2-5 years before founding, gaining industry experience and building networks. Some may launch from the capstone or immediately post-graduation.

Key PLOs Demonstrated: PLO-2 (design), PLO-4 (strategy), PLO-5 (technical), PLO-7 (leadership)

Graduate School Guidance: Not needed for founding. Some founders pursue an MBA at programs with strong entrepreneurship ecosystems (Stanford GSB, HBS, Wharton) for network access and structured learning, but this is a personal choice, not a career requirement.

7. Data Strategy and Analytics

What They Do: Data strategy professionals help organizations make better decisions through data. They bridge data engineering, data science, and business strategy to ensure organizations collect, govern, and leverage data effectively.

Why TSI Graduates Excel: TSI's data science coursework (TSI 211, 212, 311) provides technical foundations, while strategy (TSI 340) and governance (TSI 330, 332) courses address the organizational and policy dimensions of data. This combination is increasingly valued as organizations recognize that data strategy is not a purely technical problem.

Entry Roles: Data Analyst, Junior Data Strategist, Business Intelligence Analyst **Mid-Career Roles:** Senior Data Analyst, Data Strategy Lead, Analytics Manager **Senior Roles:** Chief Data Officer, VP of Data Strategy

Salary Progression: - Entry (0-2 years): $70K-$95K - Mid (5-8 years): $125K-$165K - Senior (10+ years): $200K-$430K (CDO level)

Typical Employers: All industries; particularly strong demand in financial services, healthcare, retail, and technology

Key PLOs Demonstrated: PLO-5 (technical), PLO-4 (strategy), PLO-1 (systems thinking)

Graduate School Guidance: Strongly recommended for advancement to senior technical roles. An M.S. in Data Science, Business Analytics, or Information Management significantly expands the technical ceiling and is increasingly expected for CDO-track positions. TSI provides a strong foundation for these programs. Not needed for business-facing analytics management roles.

8. Technology Policy Analyst

What They Do: Technology policy analysts research, analyze, and advocate for technology governance approaches. They work in government, think tanks, advocacy organizations, and international bodies to shape how societies govern technology.

Why TSI Graduates Excel: The policy strand (TSI 130, 230, 330, 432) provides deep policy expertise, while technical coursework ensures policy recommendations are technically grounded — a rare combination. Many policy organizations struggle to find analysts who can credibly engage with technical details of AI systems, data practices, and platform architectures.

Entry Roles: Research Assistant, Policy Analyst, Legislative Aide (tech-focused) **Mid-Career Roles:** Senior Policy Analyst, Program Director, Policy Counsel **Senior Roles:** Director of Technology Policy, Senior Fellow

Salary Progression: - Entry (0-2 years): $55K-$75K - Mid (5-8 years): $90K-$130K - Senior (10+ years): $140K-$200K+

Typical Employers: U.S. government (FTC, OSTP, NTIA, Congressional research offices), think tanks (Brookings, RAND, New America, Data & Society, AI Now), international organizations (OECD, UNESCO, World Bank), advocacy organizations (EFF, CDT, Access Now)

Key PLOs Demonstrated: PLO-3 (governance/ethics), PLO-1 (systems), PLO-6 (communication)

Graduate School Guidance: Strongly recommended for advancement. An M.P.P. (Master of Public Policy) is the standard credential for career policy analysts, and top think tanks and government agencies often require or strongly prefer it. TSI provides excellent preparation for MPP programs at Harvard Kennedy School, Georgetown McCourt, Michigan Ford, and similar institutions. A J.D. is an alternative for those interested in technology law and regulatory practice.

9. Responsible AI / AI Safety Specialist

What They Do: Responsible AI specialists develop methods, tools, and organizational practices to ensure AI systems are safe, fair, transparent, and beneficial. AI safety researchers work on technical challenges of aligning AI systems with human values and preventing harmful outcomes.

Why TSI Graduates Excel: TSI provides the rare combination of AI technical knowledge (TSI 212, 311), ethical reasoning (TSI 130, 330), and governance expertise (TSI 331, 431) needed for this rapidly growing field. The AI Governance concentration is specifically designed for this career path.

Entry Roles: Responsible AI Analyst, AI Ethics Associate, Fairness/Bias Auditor **Mid-Career Roles:** Responsible AI Lead, AI Safety Researcher, AI Ethics Manager **Senior Roles:** Head of Responsible AI, Chief AI Ethics Officer, Director of AI Safety

Salary Progression: - Entry (0-2 years): $85K-$120K - Mid (3-7 years): $140K-$190K - Senior (8+ years): $200K-$350K+

Typical Employers: Anthropic, OpenAI, Google DeepMind, Meta FAIR, Microsoft Research, AI safety organizations (MIRI, Center for AI Safety, Redwood Research), government (NIST, AISI)

Key PLOs Demonstrated: PLO-3 (ethics/governance), PLO-5 (technical), PLO-8 (technology assessment)

Graduate School Guidance: Depends on the specific role. Corporate responsible AI positions (auditing, policy, program management) do not require graduate degrees. Technical AI safety research positions at organizations like Anthropic, MIRI, or Redwood Research typically require a Ph.D. in a relevant field (CS, philosophy, cognitive science). TSI graduates interested in the technical research path should pursue a Ph.D.; those interested in governance and organizational roles can advance with experience and certifications.

Note on "AI Safety Researcher" as an entry role: Junior AI safety research positions at leading labs are extremely competitive and typically require strong ML research credentials. TSI graduates are more immediately competitive for responsible AI program management and governance roles, which can lead to safety-adjacent positions over time.

10. Science and Technology Communication

What They Do: Technology communicators translate complex technical concepts for public audiences. They work as journalists, content strategists, science writers, and communications professionals in technology organizations.

Why TSI Graduates Excel: TSI's emphasis on communication across every course (PLO-6 is threaded throughout the curriculum) combined with deep technical understanding produces graduates who can explain AI, data science, and technology policy with both accuracy and accessibility. The portfolio-based assessment model means graduates have years of writing samples demonstrating this ability.

Entry Roles: Technology Reporter, Content Strategist, Science Writer, Communications Associate **Mid-Career Roles:** Senior Technology Editor, Communications Director, Content Director **Senior Roles:** Editor-in-Chief, VP of Communications

Salary Progression: - Entry (0-2 years): $50K-$70K - Mid (5-8 years): $75K-$115K - Senior (10+ years): $120K-$180K+

Typical Employers: Media organizations (Wired, The Verge, MIT Technology Review, Ars Technica), think tanks, technology companies (communications teams), non-profits, universities

Key PLOs Demonstrated: PLO-6 (communication), PLO-1 (systems), PLO-3 (ethics), PLO-8 (technology assessment)

Graduate School Guidance: Not needed for most careers in this pathway. A graduate degree in journalism or science communication (MIT, Columbia, NYU) can provide credentialing and network access but is not required. Portfolio quality and published work matter far more than credentials.

11. Venture Capital / Technology Investment

What They Do: Technology investors evaluate, fund, and advise technology companies. They assess market opportunities, technical feasibility, team capability, and growth potential to make investment decisions.

Why TSI Graduates Excel: VC firms increasingly seek analysts who can evaluate both the technology and the market/regulatory context. TSI graduates who combine the strategy track with technical depth offer this dual capability. The program's emphasis on technology assessment (PLO-8) and business model analysis (PLO-4) directly maps to investment evaluation skills.

Entry Roles: VC Analyst, Associate (after 2-3 years industry experience) **Mid-Career Roles:** Principal, VP **Senior Roles:** Partner, Managing Director

Salary Progression: - Analyst (0-2 years): $80K-$110K base - Associate (2-5 years): $133K base + bonus - VP (5-8 years): $252K base + $83K bonus - Partner (10+ years): $400K-$600K base + carried interest

Typical Employers: Andreessen Horowitz, Sequoia, Benchmark, Accel, Kleiner Perkins, corporate venture arms (Google Ventures, Intel Capital), emerging managers

Note: VC is highly competitive for entry. Most professionals enter after 2-5 years in startup operating roles, consulting, or investment banking. TSI's product or strategy track provides the operating experience VCs value.

Key PLOs Demonstrated: PLO-4 (strategy), PLO-8 (technology assessment), PLO-5 (technical), PLO-1 (systems)

Graduate School Guidance: An MBA from a top program is common among VC professionals but not strictly required. Operating experience (PM, founder, consultant) is valued more than credentials. Some TSI graduates may pursue MBA programs with strong venture capital networks (Stanford, HBS, Wharton) after 3-5 years of operating experience.

6.6 Graduate School Pathways — Summary

TSI graduates are well-positioned for graduate study. The table below summarizes when a graduate degree adds value and when it does not.

Graduate Program	TSI Preparation	Typical Timeline	Necessity
MBA (top-10 programs)	Strategy + leadership coursework; 2-4 years work experience first	2-5 years post-graduation	Optional; accelerates senior leadership
M.S. in HCI	Design track + technical depth	Immediately or 1-2 years	Optional; deepens research capability

Graduate Program	TSI Preparation	Typical Timeline	Necessity
M.P.P. / Technology Policy	Policy strand + governance track	Immediately or 1-2 years	Strongly recommended for policy careers
J.D. (Technology Law)	Ethics/policy strand; strong writing portfolio	1-3 years post-graduation	Required for legal roles; helpful for AI governance
Ph.D. in STS, Information Science, or HCI	Research experience through capstone; strong writing portfolio	1-3 years post-graduation	Required for academic and technical research roles
M.S. in Data Science or AI	Technical strand + depth electives	Immediately with strong technical depth	Strongly recommended for technical data/ML roles

6.7 The Employer Value Proposition

The following themes consistently emerge in conversations with industry professionals about the skills gap TSI is designed to address. These are not direct quotes but represent patterns observed across employer surveys, industry reports, and advisory conversations during program development.

The translation gap: Organizations consistently report difficulty finding professionals who can communicate across technical and non-technical teams. Product managers who can't read code. Engineers who can't explain their work to executives. Policy analysts who don't understand the technology they're regulating. TSI graduates are trained to bridge these gaps from Day 1.

The ethics integration gap: As AI regulation accelerates globally (EU AI Act, NIST AI RMF, emerging US state laws), organizations are scrambling to find professionals who understand both the technology and the governance frameworks. The IAPP's 2025 AI Governance Professional report documents this shortage: demand for AI governance professionals significantly exceeds supply, with most current practitioners having pivoted from adjacent fields rather than being trained for the role.

The leadership-readiness gap: According to the World Economic Forum's Future of Jobs Report 2025, 63% of employers cite skills gaps as their biggest barrier to transformation. The specific skills most in demand — AI literacy, systems thinking, creative problem-solving, and adaptive leadership — map directly to TSI's program-level learning outcomes.

The design-thinking gap: Organizations increasingly recognize that technology solutions fail not because of technical inadequacy but because of poor understanding of user needs, organizational dynamics, and unintended consequences. Human-centered design skills, combined with technical literacy, are identified by McKinsey and IDEO research as among the most valuable interdisciplinary capabilities.

6.8 Employer Engagement and Recruiting

How TSI Connects Students to Employers

1. **Capstone Sponsors:** Direct pipeline to sponsoring organizations; many capstone projects lead to full-time offers
2. **Internship Network:** 30-40 partner organizations with dedicated TSI internship slots
3. **Advisory Board Network:** 15-20 industry leaders who actively mentor and recruit
4. **Career Showcase:** Annual event where seniors present capstone work to an audience of employers
5. **Alumni Network:** Growing network of TSI graduates (available after Year 5+ of program)

Employer Value Proposition

When recruiting TSI graduates, employers gain professionals who: - Bridge the gap between technical and non-technical teams - Think systemically about technology's organizational and societal impacts - Bring ethical reasoning into product, strategy, and governance decisions - Communicate complex ideas clearly to diverse audiences - Lead cross-functional teams through ambiguity - Arrive with a professional portfolio demonstrating applied capabilities

7 Experiential Learning

7.1 Philosophy

Experiential learning is not an add-on to the TSI curriculum — it is woven into the fabric of the program from day one. Grounded in Kolb's Experiential Learning Cycle (concrete experience, reflective observation, abstract conceptualization, active experimentation), every course in the TSI core includes hands-on application, and three dedicated experiential components — the internship, the capstone, and the cumulative portfolio — ensure graduates can demonstrate applied competency to employers.

Research consistently shows that experiential learning produces better employment outcomes. Programs with substantial real-world project components (USC Iovine Young at 90% placement, Olin College at 98%) dramatically outperform those relying primarily on classroom instruction. TSI targets 90%+ placement within 6 months of graduation.

7.2 Industry Partnership Model

Partnership Tiers

TSI operates a three-tier industry partnership model that provides value to partners while creating meaningful opportunities for students.

Tier 1: Capstone Sponsors

Commitment: Provide a capstone project brief, a dedicated sponsor liaison (senior professional who meets biweekly with student team), and $10K-$25K in project funding (covers materials, travel, software licenses, and a modest stipend pool).

Benefits to Sponsor: - First access to hire graduating students from their capstone team - Fresh perspectives on real organizational challenges from an interdisciplinary team - Deliverables: working prototype, strategy document, governance framework, or design system - Recognition in program materials and at annual showcase event - Seat on the TSI Advisory Board (for top-tier sponsors)

Target: 8-12 capstone sponsors per year (supporting 8-12 teams of 4-5 students each)

Ideal Sponsor Profile: Technology companies, consulting firms, government agencies, non-profits, and healthcare/financial organizations facing technology transition challenges they want fresh thinking on.

Engagement Timeline: - March-May: Sponsor recruitment and project brief development - June-August: Project briefs finalized and reviewed by faculty - September: Teams matched to sponsors; kickoff meetings - September-April: Active project execution with biweekly sponsor engagement - May: Final showcase, deliverable handoff, and relationship wrap-up

Tier 2: Internship Partners

Commitment: Host 1-3 TSI interns annually in structured internship experiences aligned with program learning outcomes. Provide a site supervisor who completes a mid-point and final evaluation.

Benefits to Partner: - Pre-screened, interdisciplinary interns with strong technical, business, and communication skills - Early access to a talent pipeline - Inclusion in program internship fair and materials

Target: 30-40 partner organizations, providing enough positions for each graduating cohort

Ideal Partner Profile: Technology companies (product, UX, data, strategy, governance teams), consulting firms, government technology offices, AI safety organizations, design agencies, venture capital firms

Tier 3: Guest and Practicum Partners

Commitment: Contribute through guest lectures, site visits, case study participation, practicum project clients (for concentration courses like TSI 433, 443, 446), or mentorship of individual students.

Benefits to Partner: - Visibility among future talent - Low-commitment engagement with high-quality students - Opportunity to influence curriculum through real-world feedback

Target: 50+ organizations in the broader TSI network

Advisory Board

Composition (15-20 members):

Category	Target #	Example Roles
Technology company executives	5-6	VP of Product, CTO, Head of AI, Director of Design
Consulting firm partners	3-4	Digital strategy partners, AI practice leaders
Venture capitalists / investors	2-3	Partners at funds investing in AI, enterprise tech
Government / policy leaders	2-3	Agency CTOs, Congressional tech staff, think tank directors
Non-profit / social enterprise leaders	2-3	AI ethics org directors, digital inclusion leaders
Alumni (after Year 5)	1-2	Successful graduates in diverse career paths

Advisory Board Responsibilities: - Meet twice annually (fall and spring) for program review and strategic guidance - Review program assessment data and provide industry perspective on curriculum relevance - Serve as capstone project reviewers and career showcase judges - Provide connections for internship and capstone partnerships - Participate in at least one guest lecture or mentorship activity per year

7.3 Internship Program

TSI 395 — Internship Experience (3 credits)

Timing: Summer after Year 3 (students may petition for summer after Year 2 with advisor approval)

Duration: Minimum 10 weeks full-time (400 hours)

Alignment Requirement: The internship must align with the student's declared concentration and approved career pathway. The TSI Internship Coordinator works with students to identify and evaluate opportunities.

Internship Learning Objectives

1. **Apply** TSI core competencies (technical, design, strategy, ethics) in a professional setting
2. **Analyze** organizational dynamics and technology decision-making processes in practice
3. **Develop** professional skills: workplace communication, time management, stakeholder navigation
4. **Reflect** on the connection between academic learning and professional practice

Internship Structure

Phase	Timing	Deliverable
Preparation	Spring Year 2/3	Learning agreement: goals, activities, and assessment criteria negotiated between student, site supervisor, and faculty advisor
Onboarding	Weeks 1-2	Orientation journal: observations on organizational culture, technology environment, and team dynamics
Active Learning	Weeks 3-8	Mid-point check-in with faculty advisor (30-minute video call); site supervisor mid-point evaluation
Synthesis	Weeks 9-10	Final deliverable at internship site + reflective case study (see below)
Reflection	Fall Year 4	Site supervisor final evaluation; student presents case study in TSI 491

Professional Case Study (Portfolio Artifact)

The key academic deliverable of the internship is a **2,500-word reflective case study** analyzing a technology decision the student observed or participated in during their internship. The case study must:

1. Describe the technology decision context (what was being decided, who was involved, what was at stake)
2. Analyze the decision using at least two TSI frameworks (e.g., sociotechnical systems analysis, ethical framework application, business model analysis, design thinking lens)
3. Evaluate the decision's outcomes or likely outcomes from multiple stakeholder perspectives
4. Reflect on what the student learned about professional practice that they couldn't learn in the classroom

This case study becomes a portfolio artifact and is presented in TSI 491 as part of the capstone preparation process.

Internship by Concentration

Concentration	Typical Internship Settings	Example Roles
AI Governance	AI labs, government agencies, policy organizations, corporate responsible AI teams	AI governance intern, policy research assistant, responsible AI analyst
Product & Innovation	Technology companies, startups, SaaS companies	APM intern, product analyst, product operations
Human-Centered Design	Design agencies, tech company UX teams, healthcare/fintech design	UX research intern, design intern, service design intern
Tech Strategy	Consulting firms, corporate strategy teams, VC firms	Strategy analyst intern, business analyst, VC intern

International Internship Option

TSI encourages students to pursue international internships, which provide exposure to different technology governance regimes, business cultures, and design contexts. The program maintains relationships with: - Technology policy organizations in Brussels (EU regulatory context) - Technology companies in Singapore and London - Development organizations working on digital inclusion in the Global South

Students pursuing international internships receive additional advising support and may apply for TSI International Experience grants.

7.4 Senior Capstone Project

Overview

The capstone is the culminating experience of the TSI program — a year-long, team-based project addressing a real sociotechnical challenge from an industry, government, or non-profit sponsor. It is the primary vehicle for summative assessment of all eight program-level learning outcomes.

Structure

Duration: Full academic year (September through April/May) **Team Size:** 4-5 students per team **Team Composition:** Ideally mixing concentrations to model real-world cross-functional teams **Credits:** TSI 491 (3 credits, Fall) + TSI 492 (6 credits, Spring) = 9 credits total **Faculty Supervision:** Each team has a faculty advisor who meets weekly with the team **Sponsor Engagement:** Dedicated sponsor liaison meets biweekly with the team

Capstone Phases

Phase 1: Discovery and Definition (TSI 491, Weeks 1-7)

- Meet sponsor, understand organizational context
- Define and scope the problem through stakeholder interviews, research, and analysis

- Conduct literature review, competitive analysis, and user/stakeholder research
- Present problem definition to sponsor and faculty for approval (Checkpoint 1, Week 4)
- Design methodology and success criteria
- Produce project plan with timeline, milestones, resources, and risk assessment

Phase 2: Research and Analysis (TSI 491, Weeks 8-15)

- Execute research plan
- Present preliminary findings (Checkpoint 2, Week 8; Checkpoint 3, Week 12)
- Identify key insights and pivot if necessary
- Prepare fall deliverable: research findings, refined problem definition, proposed approach
- Present fall deliverable to sponsor and faculty panel

Phase 3: Execution and Iteration (TSI 492, Weeks 1-8)

- Build, design, or develop the solution artifact
- Conduct validation cycle 1 (user testing, stakeholder review, or expert evaluation)
- Iterate based on feedback
- Present progress to sponsor (Checkpoint 4, Week 4; Checkpoint 5, Week 8)

Phase 4: Delivery and Defense (TSI 492, Weeks 9-15)

- Conduct validation cycle 2
- Finalize deliverables
- Compile comprehensive portfolio
- Public capstone showcase and defense (Week 13)
- Sponsor delivery and formal handoff (Week 14)
- Individual reflection and portfolio submission (Week 15)

Capstone Deliverables

Every capstone team produces:

1. **Working Artifact** — the primary deliverable, which varies by project type:
    - AI Governance track: Governance framework, audit toolkit, policy recommendation with implementation guide
    - Product track: Working prototype (functional, not just wireframes) with product strategy document
    - Design track: Design system, comprehensive research report, or service blueprint with implementation recommendations

- Strategy track: Strategic analysis with data-backed recommendations and implementation roadmap

2. **Strategic Recommendations Report** — a professional document (typically 15-25 pages) providing context, analysis, recommendations, and implementation guidance to the sponsor
3. **Sponsor Handoff Package** — all project materials organized for the sponsor to continue the work: source code/design files, documentation, research data, and transition notes
4. **Public Defense Presentation** — 20-minute presentation + 10-minute Q&A before a panel of faculty, industry advisory board members, and the sponsor

Capstone Assessment

Component	Weight	Assessed By	PLO Mapping
Problem definition and research report	10%	Faculty advisor	PLO-1, PLO-2
Project plan and methodology	5%	Faculty advisor	PLO-4, PLO-7
Fall deliverable and presentation	10%	Faculty panel	PLO-6
Progress reports and sponsor engagement	10%	Faculty + sponsor	PLO-6, PLO-7
Final deliverable/artifact quality	25%	Faculty panel + sponsor	PLO-2, PLO-4, PLO-5
Public capstone defense	15%	Faculty panel + advisory board	PLO-6
Comprehensive portfolio	15%	Faculty panel	All PLOs
Peer evaluation of team contribution	5%	Team members	PLO-7
Individual reflection essay	5%	Faculty advisor	All PLOs

Capstone Showcase

The annual TSI Capstone Showcase is a public event held in late April/early May. Format:

- **Poster session** (1 hour): All teams present poster summaries; open to university community and public
- **Presentations** (half-day): Each team presents to a dedicated panel of 3-4 evaluators (mix of faculty and advisory board members)
- **Awards ceremony**: Best Overall Project, Best Technical Implementation, Best Social Impact, Innovation Award (sponsor-funded prizes)

7.5 Portfolio Framework

Philosophy

The TSI portfolio is a longitudinal record of student growth across all four years. Unlike a traditional resume, the portfolio demonstrates capabilities through concrete artifacts — showing what a student can do, not just what courses they took. Portfolio-based assessment is grounded in research showing that employers value demonstrated competency over credentials, and that reflective portfolio development deepens learning.

Portfolio Platform

Students build their portfolio on their own website using a platform of their choice (common options: GitHub Pages, Notion, Squarespace, or similar). The program provides a recommended portfolio template (a simple static site) and structure but does not mandate a specific platform. This itself is a learning experience in professional self-presentation.

Portfolio platform support: The program offers a portfolio workshop in Y1 Fall (during TSI 101) to help students select a platform and set up their initial portfolio structure. Students who need additional help can attend drop-in office hours with the TSI teaching assistants.

Portfolio Artifacts by Year (10 Curated Artifacts)

The portfolio requires 10 curated artifacts over four years, reduced from 15+ in earlier drafts to ensure sustainable faculty assessment workload while maintaining coverage of all PLOs.

Year	Artifact	Source Course	Primary PLOs
1	Technology Autobiography (multimedia)	TSI 101	PLO-1, PLO-6
1	Design Project (from community challenge)	TSI 120	PLO-2, PLO-7
2	AI Project Proposal	TSI 212	PLO-5, PLO-8
2	Policy Brief	TSI 230	PLO-3, PLO-6
2	ONE additional artifact (student's choice)	TSI 210, 220, 240, or 250	Varies
3	Governance or systems artifact	TSI 330 or TSI 340	PLO-3, PLO-4
3	Concentration-specific artifact	Track courses	Varies
3	Professional Case Study (from internship)	TSI 395	PLO-1, PLO-6
4	Foresight Report	TSI 410	PLO-8, PLO-1
4	Capstone Project (working artifact + report)	TSI 491/492	All PLOs

Total: 10 curated artifacts — enough to demonstrate growth across all 8 PLOs while keeping faculty review workload manageable (~15-20 portfolio reviews per faculty member per year).

Portfolio Review Milestones

Milestone	Timing	Format	Evaluators	Stakes
Year 1 Review	End of Spring Year 1	Peer review only (no faculty scoring)	Peers	Formative, low-stakes
Year 2 Review	End of Spring Year 2	ONE faculty reviewer using a simplified rubric	One faculty member	Formative checkpoint
Year 3 Review	End of Spring Year 3	Professional review	Faculty member + ONE advisory board member	Gateway to capstone
Capstone Portfolio	End of Year 4	Public defense as part of capstone showcase	Faculty panel + advisory board	Summative

The streamlined review model reduces faculty assessment burden while maintaining meaningful feedback at each stage. Year 1 is intentionally low-stakes to build student comfort with portfolio development before formal evaluation begins.

Portfolio Assessment Rubric (Program-Level)

Each portfolio review uses a rubric aligned to the 8 PLOs, assessing:

- **Artifact Quality:** Does the work meet professional standards? Is it well-executed and polished?
- **Intellectual Depth:** Does the work demonstrate sophisticated understanding of concepts and frameworks?
- **Integration:** Does the work connect multiple disciplinary perspectives (technical, ethical, business, design)?
- **Growth:** Does the portfolio show clear progression in skill and sophistication from Year 1 to the current review?
- **Reflection:** Can the student articulate what they learned and how it connects to their professional development?

Each dimension is rated on a 4-point scale: Beginning (1), Developing (2), Proficient (3), Distinguished (4). The Year 2 review serves as a formative checkpoint; the capstone portfolio is the summative assessment.

7.6 Co-Curricular Experiential Learning

Beyond the formal curriculum, TSI supports experiential learning through:

TSI Innovation Lab

A dedicated maker/collaboration space where students can work on projects, host events, and prototype ideas. Equipped with 3D printers, electronics prototyping tools, large-format displays for design work, and collaborative work areas.

Student Organizations

- **TSI Student Council:** Organizes events, speaker series, and social activities
- **TSI Consulting Club:** Student-run pro bono consulting for local businesses and non-profits
- **TSI Design Lab:** Student-run UX research and design services for campus organizations
- **TSI Ventures:** Student-run pitch competitions, startup weekends, and entrepreneurship events
- **TSI Policy Forum:** Student-organized technology policy debates and simulations

Competitions and External Engagement

Students are encouraged to participate in: - Hackathons (local and national) - Case competitions (technology and business) - Policy challenges (e.g., AI Policy Challenge, Digital Rights competitions) - Design competitions (UX awards, design challenges) - Startup competitions (university and external)

Speaker Series

TSI hosts a bi-weekly speaker series featuring technology leaders, policymakers, entrepreneurs, designers, and ethicists. Attendance at a minimum number of talks per semester is encouraged but not graded.

8 Implementation

8.1 Overview

This document addresses the operational elements needed to launch and sustain the B.S. in Technology, Society, and Innovation program at a research university. While the curriculum design is the primary deliverable, a program is only as strong as its implementation. These considerations are grounded in common practices at peer institutions and the realities of university operations.

8.2 Faculty Hiring

Core Faculty (8-10 FTE at Steady State)

The program requires a dedicated core faculty with interdisciplinary expertise. Hiring should be phased over the program's first three years to align with enrollment growth and course sequencing.

Priority	Position	Background	Key Courses	Hire Year
1	**Program Director / Professor of Sociotechnical Systems**	STS, Information Science, or Science & Technology Policy; senior hire with administrative experience	TSI 101, 310, 410; program leadership	Year -1 (pre-launch)
2	**Professor of AI Governance**	Law/policy + CS; AI ethics, responsible AI, or technology regulation	TSI 330, 431, 432	Year -1
3	**Professor of Practice: Technology Leadership**	15+ years industry experience in technology leadership; MBA or equivalent	TSI 250; capstone coordination; industry partnerships	Year -1
4	**Assistant Professor of Computational Methods**	CS or data science; strong teaching orientation; experience with non-CS audiences	TSI 110, 211, 212, 311	Year 1
5	**Assistant Professor of Human-Centered Design**	HCI, design, or related; design practice experience	TSI 120; design track courses	Year 1
6	**Professor of Technology Strategy**	Business school; technology strategy, innovation management, or entrepreneurship	TSI 340; strategy track courses	Year 1
7	**Assistant Professor of Technology Ethics**	Philosophy + technology focus; applied ethics expertise	TSI 130, 230; ethics strand support	Year 2

Priority	Position	Background	Key Courses	Hire Year
8	**Assistant Professor of Innovation and Entrepreneurship**	Business/entrepreneurship; startup experience preferred	TSI 140, 240; venture track courses	Year 2
9	**Lecturer / Professor of Practice: Data Science**	Industry data science background; strong pedagogy	TSI 211; data electives	Year 2
10	**Lecturer / Professor of Practice: Product Management**	10+ years product management; FAANG or equivalent experience	TSI 341, 441; product track	Year 3

Affiliated and Adjunct Faculty (6-8)

- Industry professionals teaching practicum and studio courses (TSI 433, 443, 446, 423) — hired semester by semester based on expertise and availability
- Cross-appointed faculty from CS, business, law, philosophy, and public policy departments who teach courses that serve TSI students
- Visiting practitioners for short-term teaching or course modules

Faculty Governance

Joint Appointment Model: Core faculty hold joint appointments between the College of Engineering and School of Business, with tenure home in the department most aligned with their expertise. This ensures faculty are valued within their home departments for TSI teaching and service.

TSI Faculty Committee: All core faculty meet monthly to coordinate curriculum, discuss assessment results, review student progress, and make program decisions. Chaired by the Program Director.

Cross-School Steering Committee: Includes the Program Director, one senior administrator from each partner school (Engineering, Business, Arts & Sciences), and the chairs of the TSI Faculty Committee and Advisory Board. Meets quarterly to address institutional issues, resource allocation, and strategic direction.

Faculty Workload Model (Steady State: 250-300 Students)

- **Teaching load:** 2 courses per semester (4 per year) for tenure-track faculty; 3 per semester for lecturers/professors of practice
- **Advising:** ~25-30 students per core faculty member
- **Portfolio review:** Each faculty member participates in ~15-20 portfolio reviews per year (streamlined model — see 10-experiential-learning.md)

- **Capstone supervision:** Each faculty member advises 2-3 capstone teams per year
- **Committee service:** Assessment committee, curriculum committee, admissions committee (rotating)
- **Research:** Minimum 40% time protected for research (tenure-track only)

Estimated total FTE at steady state: 10-12 core + 6-8 adjunct/affiliated = 16-20 total faculty engagement

8.3 Accreditation Pathway

Institutional Accreditation

The program operates under the university's existing regional accreditation (e.g., HLC, MSCHE, SACSCOC, WSCUC, or NECHE depending on location). No separate institutional accreditation is needed.

ABET Accreditation: Realistic Assessment

Honest evaluation: ABET accreditation under traditional Engineering criteria is unlikely for TSI without adding 15+ credits of mathematics and natural science, which would fundamentally alter the program's interdisciplinary design and crowd out core TSI content.

More realistic options:

1. **Applied and Natural Science (ANS) criteria:** ABET's ANS criteria have more flexible requirements than Engineering or Engineering Technology criteria. The TSI curriculum's computational sequence, data analysis strand, and general education science requirements may satisfy ANS expectations with modest adjustments. This is the most promising ABET pathway if the university requires program-level accreditation.
2. **No disciplinary accreditation beyond institutional:** Many successful interdisciplinary programs (including peer programs like USC Iovine and Young Academy) operate without ABET or equivalent disciplinary accreditation. The program can build credibility through:
    - Outcomes data (placement rates, salary data, employer satisfaction surveys)
    - Advisory board endorsements from recognized industry leaders
    - Encouraging students to pursue industry certifications (e.g., IAPP AIGP for AI governance, PMI-ACP for product management, or similar credentials)
    - Strong capstone showcase visibility and media coverage

Recommended approach: The program should rely primarily on its **outcomes** — placement data, salary data, employer satisfaction, and graduate trajectories — rather than accreditation for credibility. If the university requires program-level accreditation, consult ABET early (Year 1) about which criteria category fits best, likely ANS.

Timeline (if pursuing ABET ANS): - Year 1: Consult ABET about criteria fit; document outcomes and assessment from day one - Years 1-4: Operate under university's institutional accreditation - Year 4:

First graduating class; begin self-study if ANS pathway is viable - Year 5-6: Submit self-study and evaluation visit - Year 6-7: Accreditation decision

AACSB Considerations

The program does **not** seek AACSB accreditation directly. However: - Business-facing courses (TSI 140, 240, 340, strategy track) should be designed so they count toward business school faculty teaching loads - Course content should align with AACSB learning goals to facilitate cross-listing and acceptance of business school elective credit - Business school co-housing provides institutional credibility without requiring separate accreditation

8.4 Admissions

Target Enrollment

Year	Cohort Size	Total Enrolled	Notes
1	40	40	Launch cohort
2	50	90	Growing awareness
3	60	150	Approaching steady state
4	60	210	First graduating class
5+	70-80	250-300	Steady state

Admissions Criteria (Holistic Review)

TSI uses holistic admissions that value intellectual breadth and curiosity across disciplines, not just technical aptitude.

Academic Record: - Strong overall GPA with evidence of engagement across disciplines - No specific AP/IB requirements, but strong performance in any rigorous course is valued - Math prerequisite: Standard college-prep math (through Algebra II/Pre-Calculus minimum; Calculus preferred but not required) - No CS prerequisite — the program is designed for students with no prior programming experience

Qualities Sought: - **Intellectual curiosity across disciplines** — applicants who read widely, have diverse interests, and ask "why" about technology and its effects - **Interest in technology AND society** — not just technically skilled, but interested in how technology shapes human experience - **Creative problem-solving** — evidence of tackling ambiguous or novel challenges - **Communication skills** — strong writers who can articulate complex ideas - **Collaborative disposition** — evidence of working effectively with others, especially across differences

Application Components: 1. Standard university application (Common App or equivalent) 2. **TSI Supplemental Essay (required):** "Describe a technology that changed something important about how people live. What made the change happen, and what was gained or lost?" (500-750 words) 3.

Optional portfolio: Students may submit a portfolio, project description, or video introduction showcasing work they're proud of — technical projects, creative work, community initiatives, research, writing, or anything that demonstrates their interests and capabilities 4. Two letters of recommendation (at least one academic) 5. Standard test scores (if required by university; TSI itself does not set score thresholds)

Transfer and Non-Traditional Entry

- Transfer students may enter TSI with up to 60 credits from other institutions; TSI core courses are generally not transferable (must be taken in-program) but general education and technical depth electives may transfer
- Students from within the university may declare TSI as late as the end of their first year if they can complete all core requirements within their remaining time
- No specific pathway for non-traditional students beyond the university's standard admissions process, but the program's lack of CS prerequisites makes it more accessible than most technology programs

Transfer Pathways and Late Entry

- **Summer bridge courses:** TSI 101 and TSI 110 are offered in summer sessions for transfer students and late declarers
- **Late entry:** Students can enter TSI as late as the start of Year 2 if they complete TSI 101 and TSI 110 in summer
- **Credit transfer:** General education and exploratory elective credits transfer normally with standard university articulation agreements; TSI core courses generally must be taken in-program (cannot be transferred)
- **Community college articulation:** Formal articulation agreements planned with top community college feeder institutions to clarify transfer pathways
- **TSI 110 support:** Students who fail TSI 110 can retake in the following semester or summer. The program offers a supplemental "TSI 110 Lab" support section providing additional structured practice and tutoring for students who need it

Parent and Family Communication

- **Dedicated parent page** on the TSI program website with program overview, career outcomes, and FAQ
- **Parent orientation session** during admitted student days, covering program structure, career pathways, and how TSI differs from traditional majors
- **Annual "TSI Family Day"** during the capstone showcase, inviting families to see student work and meet faculty
- **Quarterly parent newsletter** with student project highlights, alumni updates, and program news

- **Parent FAQ document** addressing common questions about career outcomes, technical depth, and graduate school preparation (see 12-branding-and-communication.md for full messaging guide)

Yield and Diversity Goals

- Target yield rate: 25-35% (competitive for interdisciplinary programs)
- **Diversity goals:** TSI actively recruits underrepresented groups in technology, with a goal of achieving gender parity and demographic representation that matches or exceeds the university's overall undergraduate population
- Outreach: Partnerships with programs like QuestBridge, Posse Foundation, and high school technology/society programs to build a diverse pipeline

8.5 Staffing and Operations

Administrative Staff

Role	FTE	Responsibilities
Program Director	1.0 (faculty)	Academic leadership, faculty coordination, strategic direction
Associate Director / Academic Advisor	1.0	Student advising, concentration declaration, academic planning
Internship and Career Coordinator	1.0	Internship placements, employer relationships, career services
Capstone Program Manager	0.5-1.0	Sponsor recruitment, team formation, logistics, showcase planning
Administrative Coordinator	1.0	Budget, scheduling, facilities, communications
Marketing and Recruitment	0.5	Admissions outreach, website, social media, event coordination

Space Requirements

- **TSI Innovation Lab:** Dedicated maker/collaboration space (2,000-3,000 sq ft) with prototyping equipment, collaborative work areas, and presentation space
- **Faculty offices:** 8-10 offices, ideally co-located to foster interdisciplinary collaboration
- **Classroom priority:** Studio-format classroom (movable furniture, large work surfaces) for design courses; seminar room for discussion-based courses; computer lab for technical courses
- **Student lounge/workspace:** Informal space for student collaboration and community building

Budget Considerations (Annual, Steady State)

Category	Estimated Range	Notes
Faculty salaries (8-10 FTE)	$1.2M-$1.8M	Varies by rank, market, and institution
Adjunct/visiting faculty	$150K-$250K	5-8 practitioners per year
Administrative staff (4-5 FTE)	$350K-$500K	
Capstone project funding	$100K-$250K	Partially offset by sponsor contributions
Innovation Lab operations	$50K-$100K	Equipment, materials, software licenses
Student travel/conference	$20K-$40K	Internship support, conference attendance
Marketing and recruitment	$30K-$60K	
Advisory board activities	$15K-$30K	Meetings, events, hospitality
Total annual operating	**$1.9M-$3.0M**	Before tuition revenue

Revenue model: At steady state (250-300 students), tuition revenue significantly exceeds operating costs at most private universities and R1 publics. The program is designed to be financially self-sustaining within 3-4 years.

8.6 Assessment and Continuous Improvement

Assessment Philosophy

Assessment serves two purposes in TSI: (1) ensuring students achieve learning outcomes, and (2) providing data to continuously improve the program. Grounded in the principles of constructive alignment (Biggs) and the assessment cycle recommended by ABET and AACSB, TSI implements a systematic, multi-layered assessment process.

Assessment Layers

Course-Level Assessment

- Every course syllabus specifies how each assessment maps to program-level learning outcomes (PLOs)
- Faculty submit annual course reports documenting: enrollment, grade distributions, assessment results on PLO-mapped assignments, student feedback, and planned changes

Program-Level Direct Assessment

- **Portfolio artifact scoring:** Each year, a faculty committee scores a random sample of portfolio artifacts using PLO-aligned rubrics. Different PLOs are assessed on a 2-year rotation:

  - Year A: PLO-1 (systems), PLO-3 (ethics/governance), PLO-5 (technical), PLO-7 (leadership)
  - Year B: PLO-2 (design), PLO-4 (strategy), PLO-6 (communication), PLO-8 (technology assessment)
- **Capstone rubric:** All 8 PLOs are assessed annually through capstone project rubrics scored by faculty panels

Program-Level Indirect Assessment

- **Student surveys:** End of Year 2 (mid-program) and End of Year 4 (exit survey) measuring satisfaction, perceived learning gains, and program experience
- **Alumni survey:** 1 year and 5 years post-graduation measuring career outcomes, satisfaction, and perceived relevance of TSI preparation
- **Employer survey:** Annual survey of internship supervisors, capstone sponsors, and alumni employers assessing graduate preparedness

External Review

- **Advisory Board review:** Annual review of assessment data with feedback and recommendations
- **External program review:** Comprehensive review by external evaluators every 5-7 years (standard university practice)
- **ABET review:** Every 6 years once accreditation is achieved

Closing the Loop

Annual Assessment Cycle:

Month	Activity
September	Faculty submit previous year course reports
October	Assessment committee compiles portfolio artifact scores and capstone rubric data
November	Assessment committee reviews all data (direct, indirect, external)
December	Assessment committee identifies 2-3 improvement priorities for following year
January	Improvement priorities shared with full faculty; action plans developed
February-April	Action plans implemented (curriculum adjustments, pedagogy changes)
May	Faculty retreat: review year, plan next year’s assessment focus

Key Performance Indicators

Metric	Target	Data Source	Review Frequency
4-year graduation rate	85%+	Registrar	Annual
Job placement within 6 months	90%+	Alumni survey	Annual
Median starting salary	Top quartile for similar programs	Alumni survey	Annual
Student satisfaction	4.2/5.0+	Student surveys	Annual
Employer satisfaction	4.0/5.0+	Employer survey	Annual
PLO proficiency (% at "proficient" or above)	80%+ on each PLO	Portfolio + capstone rubrics	Annual
Diversity metrics	Match or exceed university demographics	Admissions data	Annual
Student retention (Year 1 to Year 2)	90%+	Registrar	Annual
Capstone sponsor satisfaction	4.0/5.0+	Sponsor survey	Annual
Alumni engagement (5-year survey response)	50%+	Alumni office	Every 5 years

8.7 Launch Timeline

Phase 1: Pre-Launch (18-24 months before first class)

Timeline	Milestone
Month 1-3	University approval process: submit program proposal through governance (department, school, provost, board as required)
Month 3-6	Hire Program Director and 1-2 additional founding faculty
Month 4-8	Recruit initial Advisory Board members (8-10 for launch)
Month 6-9	Develop detailed course materials for Year 1 courses
Month 6-12	Build marketing materials, website, and recruitment strategy

Timeline	Milestone
Month 9-12	Recruit first cohort; conduct admissions
Month 12-15	Hire remaining Year 1 faculty; prepare Innovation Lab space
Month 15-18	Orientation planning; finalize industry partnerships for Year 1

Phase 2: Launch and Build (Years 1-4)

Year	Key Activities
Year 1	First cohort of 40 students; teach Year 1 courses; refine based on feedback; recruit Year 2 faculty; build internship partnerships
Year 2	Second cohort enters; teach Year 2 courses for first time; students declare concentrations; begin capstone sponsor recruitment; hire Year 3 faculty
Year 3	Concentration courses taught for first time; first internship cohort; continue faculty hiring; ABET self-study preparation begins
Year 4	First capstone projects; first graduates; initial placement data; first capstone showcase; submit ABET self-study

Phase 3: Maturation (Years 5-7)

Year	Key Activities
Year 5	First alumni survey (1-year post); ABET evaluation visit; program review with full data cycle; adjust curriculum based on assessment
Year 6	ABET accreditation decision; steady-state enrollment reached; first external program review
Year 7	First 5-year alumni survey; mature assessment data for continuous improvement; consider program expansion (minors, certificates, graduate pathways)

8.8 Risk Factors and Mitigation

Risk	Likelihood	Impact	Mitigation
Insufficient enrollment	Medium	High	Strong marketing; unique positioning; start with smaller cohort and grow

Risk	Likelihood	Impact	Mitigation
Faculty hiring difficulties (interdisciplinary candidates scarce)	Medium	High	Joint appointments; competitive compensation; industry practitioners as bridge hires
Industry partnership shortfall	Low-Medium	Medium	Start building relationships 18 months pre-launch; leverage advisory board networks
Accreditation challenges	Medium	Medium	Document outcomes from day one; hire faculty familiar with ABET processes; consult ABET early
Inter-school governance conflicts	Medium	Medium	Clear MOU between schools before launch; steering committee with conflict resolution process
Technology field changes faster than curriculum	Ongoing	Medium	Annual curriculum review; advisory board input; modular course design allowing topic updates
Student concentration imbalance (all choose one track)	Low-Medium	Low	Admissions messaging about all pathways; faculty advising; balanced capstone sponsor mix

8.9 Future Growth Opportunities

Once the B.S. program is established, TSI can expand through:

- **TSI Minor (15 credits):** Open to all university undergraduates — take 5 core courses for a credential in technology and society
- **TSI Certificate Programs:** Non-degree professional certificates in AI Governance, Product Management, or Technology Strategy for working professionals
- **M.S. in Technology, Society, and Innovation:** Graduate program building on the undergraduate foundation, potentially as a 1-year accelerated option for TSI B.S. graduates (SUGS pathway)
- **Executive Education:** Short-format programs for mid-career professionals on topics like AI governance, technology strategy, and responsible innovation
- **Research Center:** A TSI-affiliated research center conducting interdisciplinary research on technology transitions, funded by grants and industry partnerships

9 BRANDING AND COMMUNICATION STRATEGY

9.1 Purpose

This section addresses a challenge raised consistently across all four external reviews of the TSI program proposal: the degree title "Technology, Society, and Innovation" is unfamiliar, and unfamiliar things require explanation. This is a communication problem, not a program design problem — and it has a communication solution.

This section provides the messaging framework, positioning strategy, and stakeholder communication tools needed to ensure TSI is understood, valued, and chosen by students, parents, employers, and academic peers.

9.2 The Degree Title Strategy

Why "Technology, Society, and Innovation" — and Why the Unfamiliarity Is a Feature

TSI is not a repackaged version of an existing degree. It occupies genuinely new territory: an undergraduate program that integrates technical skill development, governance and ethics expertise, design methodology, and strategic leadership — all oriented toward the responsible development and deployment of technology. No existing degree title captures this.

The alternatives all carry baggage that misrepresents the program: - **"Information Science"** suggests library science or data management to most audiences - **"Technology Management"** sounds like an MBA-lite and undersells the technical and ethical depth - **"Digital Studies"** sounds like a humanities program with no technical component - **"Science, Technology, and Society"** (STS) signals a liberal arts approach and undersells the professional preparation

"Technology, Society, and Innovation" is intentionally unfamiliar because the program is intentionally new. The unfamiliarity creates a communication challenge — but it also creates a branding opportunity. When someone asks "What is TSI?", the answer is a conversation, not a comparison. That conversation is how we differentiate.

The Three-Letter Strategy: "TSI"

Every successful interdisciplinary program develops a recognizable abbreviation that becomes its identity: - **STS** at MIT, Cornell, Stanford — Science, Technology, and Society - **HCI** at Carnegie Mellon, Georgia Tech — Human-Computer Interaction - **MDE** at USC — Media Design + Engineering (now Iovine and Young Academy)

TSI is the program's brand. Use it consistently, early, and often. Within two years, "TSI" should be as recognizable on campus as any department abbreviation.

Always Pair with Concentration

The degree title alone is too abstract for most audiences. The solution is simple: always present the degree with the concentration.

Do this: - "B.S. in Technology, Society, and Innovation — AI Governance" - "B.S. in Technology, Society, and Innovation — Product and Innovation Management" - "TSI major, AI Governance concentration"

Not this: - "B.S. in Technology, Society, and Innovation" (alone, without context)

The concentration makes the degree immediately legible. "AI Governance" or "Product and Innovation Management" tells the audience what the graduate does; "Technology, Society, and Innovation" tells them how they think.

9.3 Elevator Pitches

Different audiences need different messages. The following pitches are designed to be memorized and delivered naturally.

Student 30-Second Pitch

"I study how to lead technology projects responsibly. I learn to code, design, analyze data, and shape policy — so I can lead teams that build technology that works for people. My concentration is in [AI Governance / Product Management / Human-Centered Design / Technology Strategy]. Think of it as the degree for people who want to lead technology organizations, not just work in them."

Student 10-Second Pitch

"I study technology leadership — how to build, govern, and scale technology responsibly."

Parent Pitch

"It is like combining computer science, business, and public policy into one degree — but designed for people who want to lead technology organizations, not just work in them. Graduates become product managers, AI governance specialists, technology consultants, and UX researchers. The program includes real coding, real data analysis, and a year-long industry project with a company sponsor."

Employer Pitch

"TSI graduates bridge the gap between your engineering team and your business, legal, and ethics teams. They can prototype in Python, analyze data, write governance policy, run a design sprint, and present to the board. They arrive with a professional portfolio from a year-long capstone with an industry sponsor."

Recruiter / ATS Keyword Pitch

Students should include these keywords on resumes and LinkedIn profiles to ensure they pass automated screening systems:

Core keywords: Product Management, AI Governance, UX Research, Technology Strategy, Data Analysis, Python, Machine Learning, Design Thinking, Stakeholder Management

Concentration-specific keywords: - *AI Governance:* AI Ethics, Responsible AI, AI Policy, Risk Assessment, Algorithmic Auditing, IAPP, Compliance - *Product & Innovation:* Agile, Product Strategy, Roadmapping, A/B Testing, User Stories, Sprint Planning, OKRs - *Human-Centered Design:* User Research, Usability Testing, Prototyping, Figma, Service Design, Inclusive Design, Accessibility - *Technology Strategy:* Digital Transformation, Business Strategy, Technology Assessment, Change Management, Competitive Analysis

9.4 Competitive Positioning Statements

These statements are designed for admissions materials, advising conversations, and student-facing communications. They position TSI relative to degrees prospective students are likely considering.

TSI vs. Computer Science

"Computer Science teaches you to build technology. TSI teaches you to lead the teams that build, deploy, and govern technology. CS graduates write the code; TSI graduates decide what gets built, for whom, and under what constraints. If you want to be a software engineer, study CS. If you want to lead the product, strategy, or governance side of technology organizations, study TSI. Many of the most effective technology leaders combine both — and TSI students can minor in CS."

TSI vs. Business / Management

"Business school teaches general management principles. TSI teaches technology-specific leadership with hands-on technical skills. TSI graduates can write Python, build prototypes, and analyze datasets — not just read a spreadsheet someone else created. The technology sector increasingly demands leaders who understand the technology they manage, not just the business around it."

TSI vs. Information Science

"Information Science studies how people interact with information systems. TSI adds business strategy, AI governance, design methodology, and a year-long industry capstone. If you are interested in libraries, archives, or information retrieval, InfoSci is a great choice. If you want to lead technology product teams, shape AI policy, or consult on technology strategy, TSI provides broader and more professionally oriented preparation."

TSI vs. STS (Science, Technology, and Society)

"STS is a liberal arts approach to studying technology in society — analytical and critical, but typically not hands-on or professionally oriented. TSI shares the analytical foundations but adds technical skill development (coding, data analysis, prototyping), professional concentrations, and a year-long industry capstone. STS produces excellent thinkers about technology; TSI produces thinkers who can also build, manage, and govern technology."

TSI vs. Data Science

"Data Science programs focus on statistical methods, machine learning, and programming — producing specialists who work with data. TSI covers data analysis and machine learning but embeds them in a broader context of strategy, governance, design, and leadership. If you want to build ML models, study Data Science. If you want to lead the teams and organizations that decide how data and AI get used, governed, and deployed, study TSI."

9.5 Parent FAQ

1. "What is this degree?"

TSI is a four-year Bachelor of Science degree that prepares students to lead technology organizations — not as engineers, but as the product managers, AI governance specialists, technology strategists, UX researchers, and consultants who determine what technology gets built, how it gets governed, and who it serves. Students develop real technical skills (programming, data analysis, prototyping) alongside strategic, ethical, and design capabilities. They choose a concentration in their area of interest and complete a year-long capstone project with an industry sponsor.

2. "Will my teenager get a job?"

Yes. TSI targets career paths with strong and growing demand: product management, AI governance, technology consulting, UX research, data analytics, and digital transformation. These roles exist at every major technology company, consulting firm, and increasingly at every large organization. The year-long capstone project creates a direct pipeline to employers — many capstone sponsors extend full-time offers. The program also maintains an internship network of 30-40 partner organizations. Salary expectations for entry-level roles range from $50K-$115K depending on the pathway and location, with strong mid-career growth.

3. "Why not just major in Computer Science?"

If your teenager wants to be a software engineer, they should study CS. But most people who work in technology are not software engineers. Product managers, strategists, designers, governance professionals, and consultants all work in technology without writing production code. CS teaches how to build software. TSI teaches how to lead the organizations that build, deploy, and govern technology — with enough technical skill to be credible in those conversations. Students who want both can minor in CS alongside TSI.

4. "It is a new program — is it risky?"

Every successful program was new once. TSI is designed based on established models at peer institutions (Stanford Symbolic Systems, USC Iovine and Young Academy, Cornell Information Science) that have proven strong employment outcomes. The curriculum was developed with input from an industry advisory board and reviewed by external academic experts. New programs also offer advantages: smaller cohorts, more faculty attention, opportunities to shape the program, and a motivated founding community. The career paths TSI targets (product management, AI governance, consulting, UX research) are not dependent on the program's reputation — they depend on demonstrated skills and portfolio quality, which the program is specifically designed to develop.

5. "Can my teenager go to graduate school?"

Yes. TSI prepares students for graduate study in multiple directions: MBA programs, M.S. in HCI or Data Science, Master of Public Policy, J.D. (technology law), and Ph.D. programs in STS, Information Science, or HCI. The program's research methods coursework, writing-intensive curriculum, and capstone project provide the academic preparation graduate programs expect. For many TSI career paths (product management, consulting, digital transformation), graduate school is optional. For others (technology policy at think tanks, academic research), it is strongly recommended, and TSI provides excellent preparation.

6. "Is there enough coding?"

TSI includes six courses with significant programming and technical content: computational thinking and programming (TSI 110), AI and machine learning foundations (TSI 212), data science for decision making (TSI 211), building intelligent systems (TSI 311), plus two technical depth electives that can include software engineering, database systems, cloud computing, or cybersecurity. Graduates will be proficient in Python, comfortable with data analysis and AI systems, and capable of building functional prototypes. This is less coding than a CS degree and more than a business degree — by design. TSI graduates need to be technically credible, not production software engineers. Students who want more programming can add a CS minor.

7. "What companies hire these graduates?"

The roles TSI targets are hired by every major technology company (Google, Meta, Amazon, Microsoft, Apple), consulting firms (McKinsey Digital, BCG, Deloitte, Accenture), financial institutions, healthcare companies, government agencies, and startups. Product managers, UX researchers, data analysts, and technology consultants work in every industry. AI governance is a rapidly growing field with demand at technology companies, government agencies, and consulting firms. The program's advisory board and capstone sponsor network provide direct connections to employers.

8. "What if my teenager changes their mind?"

TSI's breadth is an advantage here. Students choose their concentration at the end of sophomore year, and the shared core curriculum means switching concentrations is straightforward. If a student decides they want to pursue CS or another field entirely, the TSI core courses in data analysis, ethics, organizational behavior, and communication provide useful foundations for many paths. Credits in statistics, programming, and writing transfer readily to other programs. TSI is designed to keep doors open, not close them.

9. "How does this compare to [competitor school's program]?"

TSI is comparable to programs at leading universities: Stanford's Symbolic Systems program (whose alumni include the founders/CEOs of LinkedIn, Instagram, and Palantir), USC's Iovine and Young Academy (90%+ placement rate in technology roles), and Cornell's Information Science program. TSI differentiates itself through the AI Governance concentration (unique among undergraduate programs), the year-long industry capstone (deeper than most experiential learning requirements), and the integration of technical, ethical, and strategic education from the first semester.

10. "Is the investment worth it?"

Entry-level salaries for TSI's target roles range from $50K (communications/policy) to $115K (product management, consulting) in major markets, with strong mid-career growth potential. The career paths TSI targets are in growing fields with strong long-term demand — particularly AI governance, product management, and technology consulting. The degree's value comes not just from the first job but from the breadth of career options it enables: TSI graduates can move between product, strategy, governance, and design roles throughout their careers, adapting as the technology landscape evolves. That career flexibility is difficult to put a price on, but it is real.

9.6 Employer Education Strategy

TSI graduates have a communication challenge: most employers have not heard of the degree. This is normal for new programs and requires a proactive employer education strategy.

Advisory Board as Ambassador Network

The TSI Advisory Board (15-20 industry leaders) serves as the program's primary employer education channel. Board members: - Champion TSI within their own organizations' recruiting processes - Make introductions to HR and hiring managers in their networks - Provide testimonials and case studies for program marketing - Host company visits and information sessions for students - Serve as references for the program's credibility with skeptical employers

Action item: Formalize an annual "ambassador briefing" where board members receive updated talking points, placement data, and program highlights to share within their networks.

Annual Employer Showcase / Open House

Host an annual event (timed to spring capstone presentations) that brings employers onto campus to: - See senior capstone presentations and portfolio work firsthand - Meet juniors entering the internship pipeline - Hear from advisory board members about the TSI value proposition - Attend a short "TSI 101" briefing that explains the program in employer-relevant terms

This event should be treated as a recruiting and marketing investment, not an academic exercise.

The TSI Talent Brief

Create a one-page document designed for recruiters and hiring managers who encounter TSI on a resume for the first time. The Talent Brief should include: - A two-sentence program description - The four concentrations with 3-4 bullet points each on what graduates can do - A comparison to peer programs (Stanford SymSys, Cornell InfoSci, USC Iovine) - A list of target roles with keywords that map to common job postings - A QR code linking to the program website's employer page

Distribution: Students carry copies to career fairs. Faculty include them in capstone sponsor outreach. Advisory board members share them with HR contacts.

Resume Format Guidance

TSI students should lead with concentration and skills, not degree title. Recommended format:

```
EDUCATION
B.S. Technology, Society, and Innovation — AI Governance    [University Name], 20XX
  Concentration: AI Governance and Policy
  Technical Skills: Python, SQL, Tableau, machine learning, algorithmic auditing
  Key Projects: [Capstone title] with [Sponsor Company]; [Notable course project]
```

The concentration and skills line communicates competence before the reader processes the unfamiliar degree title.

LinkedIn Profile Optimization

Provide students with guidance on LinkedIn profile construction: - **Headline:** Use role-oriented language, not degree title. Example: "AI Governance | Product Strategy | TSI @ [University]" rather than "Technology, Society, and Innovation Student" - **About section:** Lead with the elevator pitch, then list concentration and key skills - **Education section:** Include concentration in the field of study, and list relevant coursework using industry-recognized terms - **Skills section:** Populate with ATS-friendly keywords from the recruiter pitch (Section B)

9.7 Social Proof Strategy (Years 1-3, Before Alumni Exist)

New programs face a chicken-and-egg problem: employers want to see successful graduates, but you need employers to create successful graduates. The following strategies build credibility before the first class graduates.

Advisory Board Testimonials

Publish named, attributed quotes from advisory board members explaining why they support the program and would hire its graduates. These quotes should appear on: - The program website's landing page - Admissions materials and viewbooks - The TSI Talent Brief - Social media and content marketing

Advisory board members agreed to be program ambassadors; use them.

Capstone Sponsor Case Studies

Beginning in Year 3 (when the first capstone cohort completes), publish case studies documenting: - The problem the sponsor organization brought to the capstone team - The approach the team took (methodology, tools, deliverables) - The outcome and its value to the sponsor - A quote from the sponsor about the team's work

These case studies serve dual purposes: they demonstrate student capability to future employers AND they attract future capstone sponsors.

Faculty Profiles and Industry Connections

Highlight faculty members' industry backgrounds, consulting relationships, and professional networks. For a new program, faculty credibility substitutes for alumni credibility. Profiles should emphasize: - Industry experience before or alongside academia - Consulting and advisory roles with technology companies - Publications and media appearances on relevant topics - Professional network that benefits students (internship connections, guest speakers, reference letters)

Comparison to Successful Peer Programs

Position TSI in the context of established programs with proven outcomes: - **Stanford Symbolic Systems:** Founded 1985, alumni include Reid Hoffman (LinkedIn), Kevin Systrom (Instagram), Mike Krieger (Instagram), Alex Karp (Palantir). Demonstrates that interdisciplinary technology degrees produce exceptional outcomes. - **USC Iovine and Young Academy:** 90%+ placement rate in technology and design roles, with graduates at Apple, Google, Tesla, and leading startups. Demonstrates market demand for interdisciplinary technology graduates. - **Cornell Information Science:** Rapid growth from niche program to one of the most popular majors at Cornell, with graduates across technology, consulting, and design. Demonstrates student demand. - **Georgetown Science, Technology, and International Affairs:** Strong placement in policy and governance roles. Demonstrates that technology-plus-policy integration has career value.

The message is not "TSI is just like these programs" — it is "these programs proved the model works, and TSI improves on it with deeper technical training, an AI governance concentration, and a year-long capstone."

Student Project Showcases

From Year 1, publish and promote the best student work from every course: - Capstone projects (Year 3+) - Design studio projects (TSI 423) - Policy memos and governance frameworks (TSI 330, 432) - Data analysis projects (TSI 211, 212) - Startup pitches and business plans (TSI 240, 343)

Create an annual "TSI Showcase" publication (digital) that compiles the year's best work with faculty commentary. This serves as portfolio evidence, marketing material, and a signal of program quality — all before a single graduate enters the workforce.

9.8 Implementation Timeline

Timeline	Action
Pre-launch (Year 0)	Finalize elevator pitches; build program website with positioning statements; recruit and brief advisory board; create TSI Talent Brief draft
Year 1	Launch social media presence; publish advisory board testimonials; host first employer information session; integrate resume/LinkedIn guidance into TSI 140
Year 2	Publish first student project showcase; refine Talent Brief based on employer feedback; expand advisory board ambassador activities; begin capstone sponsor recruitment with Talent Brief
Year 3	First capstone cohort completes; publish first case studies; host first Annual Employer Showcase; collect and publish first placement data
Year 4	First graduating class; track and publish placement outcomes; begin building alumni network; update all materials with real outcome data
Year 5+	Alumni testimonials replace hypothetical positioning; employer brand recognition builds through placement track record; program reputation becomes self-sustaining

Annex A: Core Course Syllabi

This annex contains detailed syllabi for all 18 core courses in the B.S. in Technology, Society, and Innovation program. Courses are presented in numerical order by course number.

TSI 101 — Introduction to Sociotechnical Systems

Catalog Description

Introduction to technology as embedded in social, organizational, political, and economic systems. Students explore how technologies emerge, stabilize, and transform society through theoretical frameworks including Actor-Network Theory, Social Construction of Technology, and Large Technical Systems. Case studies range from the printing press to generative AI. Students develop systems mapping skills and construct a Technology Autobiography connecting personal experience to broader sociotechnical dynamics.

Course Information

Field	Detail
Credits	3
Prerequisites	None
Semester	Year 1, Fall
Format	Two 75-minute sessions per week (lecture + discussion/activity)
Contact Hours	150 minutes/week (37.5 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Identify** key components (actors, artifacts, institutions, environments) of a sociotechnical system and describe their interrelationships *(Remember/Understand)*
2. **Explain** how technical systems co-evolve with social, economic, and political contexts using at least three theoretical frameworks (SCOT, ANT, LTS) *(Understand)*
3. **Map** stakeholders, feedback loops, and unintended consequences using systems diagramming tools including causal loop diagrams and stock-and-flow models *(Apply)*
4. **Compare** historical and contemporary cases of technology adoption to identify recurring patterns of development, resistance, and stabilization *(Analyze)*
5. **Construct** a preliminary "Technology Autobiography" connecting personal technology use to broader sociotechnical dynamics as a portfolio artifact *(Create)*

Weekly Topic Outline

Week	Topic	Key Activities
1	What is a sociotechnical system?	Concept mapping exercise; identify sociotechnical systems in daily life
2	Actor-Network Theory (Latour) and Social Construction of Technology (Pinch & Bijker)	Close reading discussion of Bijker's bicycle case; ANT mapping exercise
3	Large Technical Systems (Hughes) and Technological Momentum	Hughes framework application; compare system-building narratives
4	Systems thinking tools: causal loop diagrams, stock-and-flow	Hands-on diagramming workshop; Meadows reading discussion
5	Case: Electrification of America	Systems map exercise #1 due; group analysis of electrification stakeholders
6	Case: The Internet — ARPANET to platform capitalism	Timeline construction; identify path dependencies and lock-in
7	**Midterm: Systems maps of chosen technology**	Individual presentations of systems maps with peer feedback
8	Unintended consequences and "revenge effects" (Tenner)	Case library activity; classify types of unintended consequences
9	Technology and inequality: digital divides, algorithmic bias	Data analysis of digital divide metrics; Winner reading discussion
10	Case: Social media — design choices, behavioral impacts, regulation	Systems map exercise #2 due; stakeholder role-play debate
11	Case: Generative AI — capabilities, labor disruption, governance	AI tool exploration; map generative AI sociotechnical system
12	Technology transitions and multi-level perspective (Geels)	Apply MLP framework to a current technology transition
13	Futures thinking introduction: scenarios and weak signals	Scenario-building workshop; identify weak signals for chosen technology
14	Student Technology Autobiography presentations	Systems map exercise #3 due; peer feedback on autobiographies
15	Synthesis: What does it mean to be a "sociotechnical thinker"?	Integrative discussion; course portfolio assembly

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Weekly reading responses	15%	Short reflections (300-400 words) on assigned readings demonstrating engagement with key concepts	PLO-1
Systems mapping exercises (x3)	20%	Three progressively complex systems maps using causal loop and stock-and-flow diagrams	PLO-1, PLO-8
Midterm systems map presentation	20%	Individual presentation of a systems map for a self-selected technology, with oral defense	PLO-1, PLO-6
Case study comparative essay	20%	2,500-word essay comparing two technology adoption cases using course frameworks	PLO-1, PLO-6
Technology Autobiography (portfolio artifact)	20%	Reflective multimedia portfolio piece connecting personal technology use to sociotechnical frameworks	PLO-1, PLO-8
Participation	5%	Active engagement in discussions, activities, and peer feedback	PLO-6

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Bijker, W. E., Hughes, T. P., & Pinch, T. (Eds.). (2012). *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Anniversary Edition). MIT Press. Selected chapters: Introduction, Ch. 1 (Pinch & Bijker), Ch. 2 (Hughes), Ch. 9 (Law).
- Meadows, D. H. (2008). *Thinking in Systems: A Primer*. Chelsea Green Publishing. Chapters 1-4.
- Winner, L. (1980). Do artifacts have politics? *Daedalus*, 109(1), 121-136.
- Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case study. *Research Policy*, 31(8-9), 1257-1274.

Recommended Readings

- Johnson, S. (2014). *How We Got to Now: Six Innovations That Made the Modern World*. Riverhead Books.
- Crawford, K. (2021). *Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence*. Yale University Press.

- Tenner, E. (1996). *Why Things Bite Back: Technology and the Revenge of Unintended Consequences*. Knopf.
- Latour, B. (2005). *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford University Press. (Introduction and Ch. 1)

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-1: Sociotechnical Systems Analysis (Primary)	Students develop foundational literacy in analyzing technology as embedded in social systems through theoretical frameworks, case studies, and systems mapping exercises. This course establishes the analytical vocabulary used throughout the program.
PLO-6: Communication (Secondary)	Students practice written analysis (essays, reading responses), oral presentation (midterm, autobiography), and visual communication (systems diagrams).
PLO-8: Integrative Thinking (Secondary)	The Technology Autobiography requires students to synthesize personal experience with theoretical frameworks, building the integrative thinking capacity central to the program.

Course Policies

- **Attendance:** Students are expected to attend all sessions. More than three unexcused absences may result in a reduced participation grade.
- **Late Work:** Assignments submitted late without prior arrangement will be penalized 5% per day, up to a maximum of 25%.
- **Academic Integrity:** All work must be original. Proper citation is required for all sources. Use of generative AI tools must be disclosed and is permitted only for brainstorming, not for producing submitted text.
- **Accessibility:** Students requiring accommodations should contact the instructor and the Office of Disability Services within the first two weeks of the semester.

TSI 110 — Computational Thinking and Programming

Catalog Description

Introduction to computational thinking and Python programming for future technology leaders. Students develop fluency in decomposition, pattern recognition, abstraction, and algorithmic design while learning to write Python programs that manipulate data, automate tasks, and solve real-world problems. The course covers data manipulation and visualization with industry-standard Python libraries, version control with Git, and AI-augmented development — using AI coding assistants as development partners while building the judgment to evaluate and debug AI-generated code. No prior programming experience required.

Course Information

Field	Detail
Credits	3
Prerequisites	None
Semester	Year 1, Fall
Format	Two 50-minute lectures + one 75-minute lab per week
Contact Hours	175 minutes/week (43.75 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Decompose** complex problems into computational sub-problems using structured problem-solving strategies *(Analyze)*
2. **Write** Python programs using variables, control structures, functions, and data structures to solve defined problems *(Apply)*
3. **Manipulate** and visualize datasets using Python data libraries to extract and communicate insights *(Apply)*
4. **Explain** fundamental algorithms, computational complexity, and abstraction in non-technical language accessible to diverse stakeholders *(Understand)*
5. **Leverage** AI coding assistants as development partners, critically evaluating and debugging AI-generated code to produce reliable, well-documented solutions *(Apply/Evaluate)*
6. **Build** a working software prototype that addresses a real-world problem, documented with clear code comments and a user guide *(Create)*

Weekly Topic Outline

Week	Topic	Lab Activity
1	Computational thinking: decomposition, pattern recognition, abstraction, algorithms	Unplugged algorithms: sorting, searching, and everyday instructions
2	Python basics: variables, types, expressions, I/O	Setting up development environment; first Python programs
3	Control flow: conditionals and iteration	Building a decision-tree program; loop-based pattern generation
4	Functions, modularity, code organization	Refactoring a monolithic script into functions
5	Data structures: lists, dictionaries, sets	Building a contact manager using dictionaries
6	File I/O and data formats (CSV, JSON)	Reading and writing real-world datasets
7	**Midterm practical exam**	Timed coding assessment with problem-solving tasks
8	Introduction to pandas: loading, cleaning, exploring data	Cleaning a messy real-world dataset
9	Data visualization with matplotlib and seaborn	Creating publication-quality charts from public datasets
10	APIs and web data: requests, JSON parsing	Fetching and analyzing live data from a public API
11	Algorithms: search, sort, complexity intuition	Implementing and benchmarking search/sort algorithms
12	Version control (Git) and collaborative coding	Git workflow: branching, committing, merging, pull requests
13	AI-augmented development: synthesis and best practices	Capstone lab: building a project using AI assistants with critical evaluation of generated code
14	Final project work sessions and code reviews	Structured peer code reviews; project debugging and refinement
15	Final project presentations	Live demos and Q&A with peer and instructor feedback

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Weekly labs (x10)	25%	Hands-on coding exercises completed during lab sessions, graded on correctness and code quality	PLO-5
Homework problem sets (x4)	20%	Take-home programming assignments of increasing complexity, due biweekly	PLO-5
Midterm practical exam	15%	Timed individual coding assessment covering Weeks 1-6 material	PLO-5
Final project: prototype + documentation	30%	Working Python application addressing a real-world problem, with documentation, code comments, and a 5-minute demo presentation	PLO-5
Peer code review	10%	Structured review of two classmates' final project code; assessed on quality and constructiveness of feedback provided	PLO-5

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Severance, C. (2016). *Python for Everybody: Exploring Data Using Python 3*. Available free at py4e.com.
- Downey, A. B. (2015). *Think Python: How to Think Like a Computer Scientist* (2nd ed.). O'Reilly Media. Available free at greenteapress.com.
- McKinney, W. (2022). *Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter* (3rd ed.). O'Reilly Media. Chapters 4-7.

Recommended Readings

- Wing, J. M. (2006). Computational thinking. *Communications of the ACM*, 49(3), 33-35.
- Sweigart, A. (2019). *Automate the Boring Stuff with Python: Practical Programming for Total Beginners* (2nd ed.). No Starch Press. Available free at automatetheboringstuff.com.
- Matthes, E. (2023). *Python Crash Course* (3rd ed.). No Starch Press.

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-5: Technical Fluency (Primary)	This course builds foundational computational literacy that enables students to understand, evaluate, and build technical systems throughout the program. Students develop hands-on programming skills, data manipulation capabilities, and an understanding of computational feasibility that informs their work in all subsequent courses.

Course Policies

- **Attendance:** Lab attendance is mandatory. Students who miss more than two labs without prior arrangement may have their lab grade reduced.
- **Late Work:** Labs must be completed during the scheduled session. Homework problem sets submitted late will be penalized 10% per day, up to a maximum of 30%. No late submissions accepted after solutions are posted.
- **Collaboration Policy:** Students may discuss approaches to problems but must write all code independently unless explicitly designated as a pair/group assignment. All code must include a header comment listing any collaborators and resources consulted.
- **AI Tool Policy:** Use of generative AI coding assistants (e.g., GitHub Copilot, ChatGPT) is prohibited on homework and exams for Weeks 1-12. Week 13 explicitly covers AI-assisted coding. For the final project, AI tools may be used with full disclosure of prompts and outputs in the project documentation.
- **Academic Integrity:** Submitting code written by another person or AI without attribution constitutes an academic integrity violation. All suspected violations will be referred to the Dean of Students.
- **Accessibility:** Students requiring accommodations should contact the instructor and the Office of Disability Services within the first two weeks of the semester.

TSI 120 — Human-Centered Design Thinking

Catalog Description

Introduction to human-centered design thinking methodology through the full design cycle: empathize, define, ideate, prototype, and test. Student teams tackle a real design challenge sourced from a community or industry partner, progressing from user research through iterative prototyping to a final design presentation. Emphasis on empathy-driven research, inclusive design, and communicating design rationale to diverse audiences. Students develop skills in interviewing, synthesis, rapid prototyping (paper and digital), and usability testing.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 101 Introduction to Sociotechnical Systems
Semester	Year 1, Spring
Format	Studio — one 3-hour session per week (lecture + hands-on workshop)
Contact Hours	180 minutes/week (45 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Conduct** user research using interviews, observation, and surveys to identify latent needs and unmet opportunities *(Apply)*
2. **Synthesize** qualitative research data into actionable problem statements ("How Might We" questions) and evidence-based personas *(Analyze)*
3. **Generate** diverse solution concepts using structured ideation techniques including brainstorming, SCAMPER, and analogical thinking *(Create)*
4. **Build** low-fidelity (paper) and medium-fidelity (digital) prototypes that embody design hypotheses *(Create)*
5. **Evaluate** design solutions through user testing, heuristic evaluation, and iterative refinement based on evidence *(Evaluate)*

Weekly Topic Outline

Week	Topic	Key Activities
1	What is design thinking? History, principles, the double diamond	Design challenge introduction; team formation; partner briefing
2	Empathize I: Planning and conducting user interviews	Interview guide development; practice interviews in pairs
3	Empathize II: Observation, contextual inquiry, cultural probes	Field observation exercise; cultural probe kit design
4	Define I: Affinity mapping and insight synthesis	Wall-sized affinity mapping workshop with research data
5	Define II: Personas, journey maps, "How Might We" statements	**User research report due**; persona and journey map construction
6	Ideate I: Divergent thinking techniques	Brainstorming, brainwriting, SCAMPER, worst possible idea
7	Ideate II: Convergent thinking, concept selection, storyboarding	**Problem definition deliverable due**; dot voting, decision matrices, storyboard creation
8	Prototype I: Paper prototyping and bodystorming	Rapid paper prototype construction; bodystorming session
9	Prototype II: Digital prototyping (Figma basics)	Figma workshop: frames, components, interactive prototyping
10	Test I: Usability testing and think-aloud protocols	**Ideation portfolio due**; conduct usability tests with recruited participants
11	Test II: Iteration based on feedback; pivot decisions	Analyze test results; identify patterns; revise prototypes
12	Design for inclusion: accessibility, universal design	Accessibility audit of prototypes; WCAG principles; inclusive design patterns
13	Communicating design: pitch decks and design rationale	Pitch deck workshop; practice presentations with peer feedback
14	Final design reviews with external critics	**Prototype + usability test report due**; presentations to partner and guest critics
15	Reflection: Design thinking beyond products — services, systems, organizations	Team reflection workshop; individual reflection essays; peer evaluations

Assessment Methods

Assessment	Weight	Description	PLO Mapping
User research report	15%	Team deliverable documenting interview protocols, observation notes, key findings, and research ethics considerations	PLO-2, PLO-6
Problem definition deliverable	15%	Personas, journey maps, and "How Might We" statements synthesized from research, with rationale	PLO-2
Ideation portfolio	10%	Documentation of divergent and convergent ideation process, including sketches, concept descriptions, and selection criteria	PLO-2
Prototype + usability test report	20%	Working prototype (paper or digital) with documented usability test plan, results, and iteration decisions	PLO-2, PLO-7
Final design presentation (portfolio artifact)	25%	Team pitch to external reviewers: problem framing, process documentation, final prototype, design rationale, and next steps	PLO-2, PLO-6, PLO-7
Team reflection + peer evaluation	10%	Individual reflection on team dynamics, personal growth, and lessons learned; confidential peer evaluation of team contributions	PLO-7
Participation in critiques	5%	Quality of feedback given during peer reviews, guest critic sessions, and in-class workshops	PLO-6

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Norman, D. A. (2013). *The Design of Everyday Things* (Revised and Expanded Edition). Basic Books.
- IDEO.org. (2015). *The Field Guide to Human-Centered Design*. Available free at designkit.org.
- Brown, T. (2009). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*. Harper Business. Chapters 1-5.

Recommended Readings

- Krug, S. (2014). *Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability* (3rd ed.). New Riders.
- Liedtka, J., & Ogilvie, T. (2011). *Designing for Growth: A Design Thinking Tool Kit for Managers*. Columbia Business School Publishing.
- Costanza-Chock, S. (2020). *Design Justice: Community-Led Practices to Build the Worlds We Need*. MIT Press. (Introduction and Ch. 2)
- Buxton, B. (2007). *Sketching User Experiences: Getting the Design Right and the Right Design*. Morgan Kaufmann.

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-2: Human-Centered Design (Primary)	This course provides the foundational design thinking methodology that students apply throughout the program. Students practice the full empathize-define-ideate-prototype-test cycle with a real partner, developing the empathy-driven, iterative design skills central to the TSI program identity.
PLO-6: Communication (Secondary)	Students communicate design ideas through multiple modalities: written reports, visual prototypes, oral presentations, and pitch decks. They learn to articulate design rationale to both technical and non-technical audiences, including external partners and critics.
PLO-7: Collaboration (Secondary)	The team-based design challenge requires students to navigate group dynamics, divide labor, integrate diverse perspectives, and deliver collective work products. Peer evaluation and team reflection build collaborative capacity.

Course Policies

- **Attendance:** Studio attendance is essential. The hands-on, team-based nature of the course means missed sessions cannot be replicated independently. More than two unexcused absences may result in a reduced grade.
- **Late Work:** Team deliverables submitted late without prior arrangement will be penalized 5% per day. Late submissions disrupt the iterative design process and may affect the entire team.
- **Materials:** Students should bring sketchbooks and basic prototyping materials (markers, Post-its, scissors, tape) to every session. Digital prototyping will use Figma (free education license).

- **Partner Engagement:** Teams will interact directly with community/industry partners. Professional conduct, punctuality, and responsiveness are expected in all partner communications.
- **Academic Integrity:** All research must follow ethical guidelines for human subjects. Design work must be original; visual assets from external sources must be cited.
- **Accessibility:** Students requiring accommodations should contact the instructor and the Office of Disability Services within the first two weeks of the semester.

TSI 130 — Ethics of Technology

Catalog Description

Systematic examination of ethical frameworks applied to technology design, deployment, and governance. Students engage with utilitarian, deontological, virtue ethics, care ethics, and justice-based approaches to analyze pressing technology controversies including privacy and surveillance, algorithmic fairness, autonomy and manipulation, labor displacement, and data ethics. Through structured debates, case analyses, and an extended ethics position paper, students develop the capacity to construct rigorous, evidence-based ethical arguments about current and emerging technology issues.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 101 Introduction to Sociotechnical Systems
Semester	Year 1, Spring
Format	Two 75-minute sessions per week (seminar discussion + case analysis)
Contact Hours	150 minutes/week (37.5 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Describe** major ethical frameworks (utilitarian, deontological, virtue ethics, care ethics, justice-based) and articulate their core principles, strengths, and limitations *(Understand)*
2. **Apply** ethical frameworks systematically to analyze technology design decisions, deployment contexts, and governance challenges *(Apply)*
3. **Evaluate** competing ethical claims about technology controversies using structured argumentation and evidence *(Evaluate)*
4. **Identify** stakeholders, power dynamics, and distributional consequences in technology ethics controversies *(Analyze)*
5. **Construct** an evidence-based ethical argument about a current technology issue, integrating multiple frameworks and counterarguments, in a 3,000-word position paper *(Create)*

Weekly Topic Outline

Week	Topic	Key Activities
1	Why technology ethics? The Collingridge dilemma, the pacing problem, and the responsibility gap	Opening case: self-driving car trolley problems and their limitations
2	Consequentialism and utilitarianism	Case analysis: cost-benefit frameworks in technology risk assessment
3	Deontology and rights-based approaches	Case analysis: privacy as a right vs. a preference; GDPR foundations
4	Virtue ethics, care ethics, and justice as fairness	Vallor reading discussion; care ethics applied to AI caregiving systems
5	Privacy and surveillance	Case analysis: facial recognition, predictive policing, Zuboff's surveillance capitalism
6	Algorithmic fairness: definitions, impossibility theorems, cases	**Framework application exercise #1 due**; COMPAS case study; Chouldechova impossibility result
7	**Midterm: Structured debate**	Teams debate assigned positions on a current technology ethics controversy
8	Autonomy and manipulation: persuasive design, dark patterns	Case analysis: attention economy, nudge architecture, children's technology
9	AI and labor: automation, displacement, future of work	**Framework application exercise #2 due**; scenario analysis of automation futures
10	Data ethics: consent, ownership, and the data economy	Case analysis: genomic data, smart city data, indigenous data sovereignty
11	Emerging technology ethics: gene editing, autonomous weapons, brain-computer interfaces	Ethical anticipation exercise: apply frameworks to pre-deployment technologies
12	Global perspectives: technology ethics across cultures	**Framework application exercise #3 due**; comparative analysis of EU, US, Chinese, and Global South approaches
13	From ethics to policy: translating moral reasoning into governance	Policy memo workshop: converting ethical arguments into actionable recommendations
14	Peer review workshop for ethics position papers	Structured peer review using provided rubric; revision planning

Week	Topic	Key Activities
15	**Final: Ethics position paper defenses**	Oral defense of position papers with Q&A from instructor and peers

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Weekly case analyses (x10)	20%	500-word written analyses of assigned cases applying that week's ethical framework; best 10 of 12 counted	PLO-3, PLO-1
Framework application exercises (x3)	15%	Structured exercises requiring students to apply multiple ethical frameworks to a single technology case, comparing conclusions	PLO-3
Midterm structured debate	15%	Team-based formal debate on an assigned technology ethics proposition; graded on argument quality, evidence use, and engagement with counterarguments	PLO-3, PLO-6
Ethics position paper (3,000 words; portfolio artifact)	30%	Extended argumentative essay on a self-selected technology ethics topic, integrating at least two frameworks, empirical evidence, stakeholder analysis, and counterargument engagement	PLO-3, PLO-6, PLO-1
Final oral defense	15%	10-minute presentation of position paper thesis and argument, followed by 5-minute Q&A; graded on clarity, rigor, and responsiveness	PLO-3, PLO-6
Participation	5%	Quality of contributions to seminar discussions, case analyses, and peer review	PLO-6

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Vallor, S. (2016). *Technology and the Virtues: A Philosophical Guide to a Future Worth Wanting*. Oxford University Press. Selected chapters: Introduction, Ch. 1-3, Ch. 6-7.

- Floridi, L. (2013). *The Ethics of Information*. Oxford University Press. Selected chapters: Ch. 1-2, Ch. 4, Ch. 6.
- O'Neil, C. (2016). *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. Crown.
- Zuboff, S. (2019). *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. PublicAffairs. Part I (Chapters 1-7).

Recommended Readings

- Eubanks, V. (2018). *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor*. St. Martin's Press.
- Benjamin, R. (2019). *Race After Technology: Abolitionist Tools for the New Jim Code*. Polity.
- Mittelstadt, B. D., Allo, P., Taddeo, M., Wachter, S., & Floridi, L. (2016). The ethics of algorithms: Mapping the debate. *Big Data & Society*, 3(2), 1-21.
- Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. *Nature Machine Intelligence*, 1(9), 389-399.
- Rawls, J. (1971). *A Theory of Justice*. Harvard University Press. Chapters 1-2 (for justice framework background).

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-3: Ethical Reasoning (Primary)	This course provides the foundational ethical reasoning capacity for the program. Students learn to move beyond intuitive moral reactions to systematic, framework-based analysis of technology decisions. The position paper serves as a portfolio artifact demonstrating ethical argumentation skills.
PLO-6: Communication (Secondary)	Students develop written argumentation (case analyses, position paper), oral argumentation (debate, defense), and peer review skills. The emphasis on structured argumentation builds communication capacity applicable across the program.
PLO-1: Sociotechnical Systems Analysis (Secondary)	Ethical analysis requires understanding how technologies are embedded in social systems. Students draw on TSI 101 frameworks to identify stakeholders, power dynamics, and systemic consequences as inputs to ethical reasoning.

Course Policies

- **Attendance:** Seminar participation is central to this course. More than three unexcused absences will result in a reduced participation grade and may affect the final grade by up to one letter.
- **Late Work:** Weekly case analyses cannot be submitted late (best 10 of 12 policy provides flexibility). The position paper will be penalized 5% per day if submitted late. Extensions must be requested at least 48 hours in advance.
- **Discussion Norms:** This course addresses controversial topics. Students are expected to engage respectfully with diverse viewpoints, argue positions rather than attack individuals, and be willing to steelman opposing arguments.
- **AI Tool Policy:** Use of generative AI is permitted for brainstorming and outlining but not for drafting submitted text. All submitted work must represent the student's own reasoning and writing. Students must disclose any AI tool use in an appendix.
- **Academic Integrity:** Proper citation of all sources is required. Plagiarism, including uncited paraphrasing, will be referred to the Dean of Students. The position paper will be checked against plagiarism detection tools.
- **Accessibility:** Students requiring accommodations should contact the instructor and the Office of Disability Services within the first two weeks of the semester.

TSI 140 — Business Fundamentals for Technologists

Catalog Description

Rapid survey of core business concepts designed for the tech-business intersection. Students develop financial literacy, marketing fundamentals, organizational behavior awareness, operations understanding, and economics of technology markets. The course uses technology company cases throughout, ensuring that every business concept is grounded in the contexts students will encounter as technology professionals. Students culminate the course by constructing a business model canvas and pitch for a technology venture.

Course Information

Field	Detail
Credits	3
Prerequisites	None
Semester	Year 1, Spring
Format	Two 75-minute sessions per week (lecture + case discussion)
Contact Hours	150 minutes/week (37.5 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Explain** fundamental concepts in accounting, finance, marketing, operations, and organizational behavior as they apply to technology companies (Understand)
2. **Interpret** financial statements and key performance metrics for technology businesses, including SaaS, platform, and hardware models (Understand/Analyze)
3. **Apply** established business frameworks — Porter's Five Forces, SWOT analysis, value chain analysis, and the Business Model Canvas — to evaluate technology companies and markets (Apply)
4. **Analyze** how technology markets differ from traditional markets through network effects, platform dynamics, winner-take-all tendencies, and switching costs (Analyze)
5. **Construct** a complete business model canvas for a technology venture, supported by market analysis and a compelling investor-style pitch (Create)

Weekly Topic Outline

Week	Topic	Activities & Readings
1	Business language and why technologists need it	Course overview; case: Why technical founders fail at business; Osterwalder Ch 1
2	Financial statements: the language of business	Reading income statements, balance sheets, cash flow; case: Apple's financial structure; Ries Ch 1-2
3	Tech metrics: CAC, LTV, MRR, burn rate	SaaS metrics deep dive; case: Slack's path to profitability; guest: startup CFO (virtual)
4	Marketing fundamentals for technology products	Segmentation, targeting, positioning; product-market fit; case: Notion's growth strategy
5	Organizational behavior and tech culture	Team dynamics, culture as competitive advantage; case: Netflix culture deck; Ries Ch 3-5
6	Operations and supply chain in tech	Hardware vs. software operations; lean manufacturing; case: Tesla's production challenges
7	**Midterm exam**	Covers Weeks 1-6; format: case analysis + short answer
8	Economics of tech markets: network effects and platforms	Two-sided markets, winner-take-all dynamics; Parker et al. selections; case: Uber vs. Lyft
9	Competitive strategy: Porter's frameworks	Five Forces applied to tech; value chain analysis; case: Microsoft's strategic pivot to cloud
10	Business model innovation: the canvas	Business Model Canvas workshop; Osterwalder Ch 2-4; case: Airbnb's BMC evolution
11	Venture capital and startup finance	Fundraising, valuation, term sheets, dilution; Ries Ch 6-8; case: a Series A term sheet negotiation
12	Corporate innovation and intrapreneurship	Innovation labs, internal ventures, acquisition strategies; case: Google X / Alphabet structure
13	Technology adoption lifecycle	Crossing the chasm, diffusion of innovation; Moore selections; case: Zoom's pandemic inflection
14	Final project working sessions	Team workshops; BMC refinement; pitch rehearsals with peer feedback
15	**Final presentations: Business Model Canvas pitch**	Team presentations to faculty and guest evaluators; course synthesis

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Weekly case preparation & participation	10%	Brief written case prep (1 page) submitted before each case discussion session	PLO-1, PLO-4
Financial statement exercise	10%	Individual analysis of a public tech company's financials with interpretation of key metrics	PLO-4
Midterm exam	20%	Case-based exam applying business concepts from Weeks 1-6 to a novel technology company scenario	PLO-4, PLO-1
Business framework papers (x2)	20%	Two short papers (1,500 words each) applying Porter's Five Forces, SWOT, or value chain to a tech company	PLO-4, PLO-1
Business Model Canvas + pitch (team project)	30%	Team of 3-4 develops a complete BMC for a technology venture with market analysis and delivers a 10-minute investor-style pitch	PLO-4, PLO-1
Class participation	10%	Active engagement in case discussions, workshops, and peer feedback	PLO-4

Required Readings

- Osterwalder, A. & Pigneur, Y. (2010). *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. Wiley.
- Ries, E. (2011). *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. Chapters 1-8. Crown Business.
- HBS Case Pack: Technology company cases (available via course pack purchase). Cases include Slack, Netflix, Tesla, Uber, Airbnb, Microsoft, Google/Alphabet, and Zoom.

Recommended Readings

- Parker, G., Van Alstyne, M., & Choudary, S. P. (2016). *Platform Revolution: How Networked Markets Are Transforming the Economy and How to Make Them Work for You*. W. W. Norton.
- Moore, G. A. (2014). *Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Customers*. 3rd edition. Harper Business.

Connection to Program Learning Outcomes

PLO	Alignment	Contribution
PLO-4: Business and Entrepreneurial Acumen	**Primary**	This course provides the foundational business vocabulary, frameworks, and analytical skills that technologists need to operate at the intersection of technology and business. Students learn to read financial statements, analyze competitive markets, and construct business models.
PLO-1: Systems Thinking and Integration	**Secondary**	Business analysis inherently requires systems thinking — understanding how financial, marketing, operational, and organizational components interact within technology companies and markets. Framework application reinforces integrative analysis.

Course Policies

- **Case Preparation**: Students are expected to read assigned cases before class and submit a one-page case prep memo via the LMS by 8:00 AM on discussion days.
- **Team Formation**: Teams of 3-4 for the final BMC project will be formed in Week 8. Teams should include diverse skill sets and backgrounds.
- **Late Work**: Case preps are not accepted late. Papers receive a half-letter grade deduction per day late. Team project deadlines are firm.
- **Academic Integrity**: All individual work must be original. AI tools may be used for research and brainstorming but not for drafting submitted work. Proper citation of all sources is required.

Technology Requirements

- Access to financial databases (provided via university library): SEC EDGAR, PitchBook, or Crunchbase
- Spreadsheet software for financial analysis exercises
- Business Model Canvas tools (Strategyzer or equivalent)

TSI 210 — Technology and Organizational Change

Catalog Description

Examines how organizations adopt, resist, and transform through technology. Students engage with organizational theory, change management frameworks, institutional dynamics, and technology adoption models. Through case studies of successful and failed technology implementations, students learn to diagnose organizational readiness, design change strategies, and evaluate the interplay of culture, incentives, and technical systems. Emphasis on applying theoretical models to real organizational contexts through simulation exercises and case analysis.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 101, TSI 140
Semester	Year 2, Fall
Format	Two 75-minute sessions per week (lecture + case discussion/simulation)
Contact Hours	150 minutes/week (37.5 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Analyze** the structural, cultural, and political factors that shape how organizations adopt or resist new technologies *(Analyze)*
2. **Apply** technology adoption models (TAM, UTAUT, Diffusion of Innovations) to predict and explain adoption outcomes in specific organizational contexts *(Apply)*
3. **Compare** change management frameworks (Kotter, Lewin, ADKAR) and select appropriate strategies for a given organizational transformation scenario *(Analyze)*
4. **Evaluate** the success and failure of real-world digital transformation initiatives using stakeholder analysis and organizational theory *(Evaluate)*
5. **Design** a change management plan for a technology implementation that addresses organizational culture, stakeholder interests, and power dynamics *(Create)*

Weekly Topic Outline

Week	Topic	Key Activities
1	Organizations as systems: structure, culture, and incentives	Map an organization's formal and informal structures; identify technology touchpoints
2	Technology adoption models I: Diffusion of Innovations (Rogers)	Adopter category exercise; plot adoption curves for historical technologies
3	Technology adoption models II: TAM, UTAUT, and extensions	Apply TAM/UTAUT to a campus technology; compare model predictions
4	Organizational culture and technology: Schein's model	Culture diagnosis exercise using artifacts, espoused values, and assumptions
5	Change management I: Lewin's three-stage model and force field analysis	Force field analysis workshop; Case: ERP implementation failure
6	Change management II: Kotter's 8-step process	Case: Satya Nadella's cultural transformation at Microsoft
7	**Midterm: Case analysis presentations**	Teams present diagnosis of a technology implementation case with framework application
8	Change management III: ADKAR and individual-level change	ADKAR self-assessment; simulation: rolling out a new collaboration platform
9	Power, politics, and technology decisions	Stakeholder mapping exercise; reading discussion on organizational politics
10	Organizational learning and ambidexterity	Case: Amazon's dual-track innovation; explore vs. exploit simulation
11	Digital transformation: strategy, execution, and measurement	ROI analysis workshop; Case: a failed digital transformation in healthcare
12	Platform organizations and ecosystem dynamics	Map a platform ecosystem; analyze governance and incentive structures
13	AI adoption in organizations: readiness, resistance, and workforce impact	AI readiness assessment tool; Case: AI deployment in financial services
14	Student change management plan presentations	Teams present change management plans; peer and instructor feedback
15	Synthesis: becoming a change-capable technology leader	Integrative discussion; portfolio reflection on organizational change leadership

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Weekly reading responses	10%	Short reflections (300-400 words) connecting readings to organizational examples	PLO-1
Case analysis briefs (x3)	20%	Three structured case analyses applying course frameworks to real technology implementations	PLO-1, PLO-4
Midterm case presentation	20%	Team presentation diagnosing a technology adoption/change case using multiple frameworks	PLO-1, PLO-6, PLO-7
Change management simulation	15%	In-class simulation where teams manage a technology rollout, responding to emerging challenges	PLO-4, PLO-7
Change management plan (portfolio artifact)	30%	Comprehensive change management plan for a real or realistic technology implementation scenario	PLO-1, PLO-4, PLO-7
Participation	5%	Active engagement in discussions, simulations, and peer feedback	PLO-6

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Kotter, J. P. (2012). *Leading Change* (2nd Edition). Harvard Business Review Press.
- Rogers, E. M. (2003). *Diffusion of Innovations* (5th Edition). Free Press. Selected chapters: 1, 5, 6, 8.
- Christensen, C. M. (2016). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail* (Reprint Edition). Harvard Business Review Press. Chapters 1-4.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478.

Recommended Readings

- Westerman, G., Bonnet, D., & McAfee, A. (2014). *Leading Digital: Turning Technology into Business Transformation*. Harvard Business Review Press.
- Schein, E. H., & Schein, P. A. (2017). *Organizational Culture and Leadership* (5th Edition). Wiley.

- Hiatt, J. M. (2006). *ADKAR: A Model for Change in Business, Government, and Our Community*. Prosci Research.
- Nadella, S. (2017). *Hit Refresh: The Quest to Rediscover Microsoft's Soul and Imagine a Better Future for Everyone*. Harper Business.

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-1: Evaluate Complex Sociotechnical Systems (Primary)	Students analyze organizations as sociotechnical systems, diagnosing how structure, culture, incentives, and technology interact to produce adoption or resistance outcomes. Builds directly on TSI 101 systems thinking.
PLO-4: Formulate and Execute Innovation Strategies (Secondary)	Students design change management plans and evaluate technology implementation strategies, developing practical skills in organizational innovation leadership.
PLO-7: Lead Cross-Functional Teams (Secondary)	Team-based case analyses and simulations require students to collaborate across perspectives, negotiate strategies, and present unified recommendations.

Course Policies

- **Attendance:** Students are expected to attend all sessions. More than three unexcused absences may result in a reduced participation grade.
- **Late Work:** Assignments submitted late without prior arrangement will be penalized 5% per day, up to a maximum of 25%.
- **Academic Integrity:** All work must be original. Proper citation is required for all sources. Use of generative AI tools must be disclosed and is permitted only for brainstorming, not for producing submitted text.
- **Accessibility:** Students requiring accommodations should contact the instructor and the Office of Disability Services within the first two weeks of the semester.

TSI 211 — Data Science for Decision Making

Catalog Description

Applied data science for technology-oriented decision makers. Students develop skills in exploratory data analysis, statistical inference, regression, A/B testing, and data visualization using Python and standard data science libraries. Emphasis on interpreting results, communicating insights to non-technical audiences, and making evidence-based decisions rather than purely technical execution. Students complete a semester-long data analysis project culminating in a decision brief and interactive dashboard.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 110, STAT 201 or MATH 151
Semester	Year 2, Spring
Format	Two 50-minute lectures + one 75-minute lab per week
Contact Hours	175 minutes/week (43.75 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Conduct** exploratory data analysis using Python to summarize, visualize, and identify patterns in real-world datasets *(Apply)*
2. **Apply** hypothesis testing and regression analysis to answer decision-relevant questions, distinguishing correlation from causation *(Apply)*
3. **Design** an A/B test with appropriate sample size, randomization, and statistical criteria for a business or policy question *(Apply/Create)*
4. **Create** clear, accurate, and persuasive data visualizations following established design principles *(Create)*
5. **Evaluate** data quality, potential biases, and limitations of analytical conclusions before recommending decisions *(Analyze)*
6. **Communicate** data-driven insights through written briefs and oral presentations tailored to non-technical stakeholders *(Apply)*

Weekly Topic Outline

Week	Topic	Key Activities
1	The data science workflow: question, data, analysis, communication	Set up Python environment; explore a sample dataset end-to-end
2	Descriptive statistics and distributions	Lab: pandas fundamentals — loading, cleaning, summarizing data
3	Data visualization I: principles and practice (Tufte, Cairo)	Lab: matplotlib and seaborn basics; critique published visualizations
4	Data cleaning and quality assessment	Lab: handling missing data, outliers, and data type issues in pandas
5	Hypothesis testing and confidence intervals	Lab: t-tests and chi-square tests on real datasets; interpret p-values
6	Correlation vs. causation: observational data pitfalls	Lab: Simpson's paradox exercise; confounding variable analysis
7	**Midterm: Data analysis practical exam**	Individual timed analysis of a novel dataset with written interpretation
8	Simple and multiple regression	Lab: build and interpret regression models; check assumptions
9	A/B testing: design, execution, and analysis	Lab: analyze a real A/B test dataset; calculate effect sizes and power
10	SQL basics for data extraction	Lab: query a relational database to prepare data for analysis
11	Data visualization II: storytelling with data and dashboard design	Lab: build an interactive dashboard; Knaflic reading discussion
12	Data ethics: bias, privacy, and responsible analytics	Case: algorithmic bias in hiring; discuss data governance frameworks
13	Communicating data insights: the decision brief	Workshop: draft and peer-review decision briefs from project data
14	Student project presentations	Teams present data analysis projects with dashboards to a panel
15	Synthesis: the data-informed leader	Integrative discussion; portfolio assembly; course reflection

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Weekly labs	20%	Hands-on lab exercises submitted as Jupyter notebooks with code and written interpretations	PLO-5
Data visualization portfolio (x3)	15%	Three polished visualizations with design rationale memos	PLO-5, PLO-6
Midterm practical exam	20%	Timed individual data analysis with written interpretation of a novel dataset	PLO-5, PLO-4
A/B test design proposal	10%	Design an A/B test for a real product or policy question with statistical justification	PLO-4, PLO-5
Final project: data analysis and decision brief (portfolio artifact)	30%	Team project analyzing a real dataset, producing a dashboard and written decision brief for a non-technical audience	PLO-5, PLO-6, PLO-4
Participation	5%	Active engagement in discussions, labs, and peer feedback	PLO-6

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Wheelan, C. (2014). *Naked Statistics: Stripping the Dread from the Data*. W. W. Norton & Company.
- Cairo, A. (2016). *The Truthful Art: Data, Charts, and Maps for Communication*. New Riders.
- McKinney, W. (2022). *Python for Data Analysis* (3rd Edition). O'Reilly Media. Selected chapters: 4, 5, 7, 9, 10.
- Knaflic, C. N. (2015). *Storytelling with Data: A Data Visualization Guide for Business Professionals*. Wiley. Chapters 1-4, 7.

Recommended Readings

- Bruce, P., Bruce, A., & Gedeck, P. (2020). *Practical Statistics for Data Scientists* (2nd Edition). O'Reilly Media.
- Kohavi, R., Tang, D., & Xu, Y. (2020). *Trustworthy Online Controlled Experiments: A Practical Guide to A/B Testing*. Cambridge University Press.

- D'Ignazio, C., & Klein, L. F. (2020). *Data Feminism*. MIT Press.
- Spiegelhalter, D. (2019). *The Art of Statistics: How to Learn from Data*. Basic Books.

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-5: Develop and Deploy Computational Artifacts (Primary)	Students build computational artifacts (analysis notebooks, dashboards, visualizations) using Python throughout the course. Lab exercises and the final project produce functional, deployable data products.
PLO-6: Communicate Complex Technical Concepts (Secondary)	Students practice translating statistical findings into plain-language decision briefs and oral presentations for non-technical audiences. Visualization exercises emphasize clarity and audience awareness.
PLO-4: Formulate and Execute Innovation Strategies (Secondary)	A/B testing, data-driven decision briefs, and the final project require students to connect analytical findings to strategic recommendations and evidence-based action.

10Course Policies

- **Attendance:** Students are expected to attend all sessions. More than three unexcused absences may result in a reduced participation grade.
- **Late Work:** Assignments submitted late without prior arrangement will be penalized 5% per day, up to a maximum of 25%.
- **Academic Integrity:** All work must be original. Proper citation is required for all sources. Use of generative AI tools must be disclosed and is permitted only for brainstorming, not for producing submitted text.
- **Accessibility:** Students requiring accommodations should contact the instructor and the Office of Disability Services within the first two weeks of the semester.

TSI 212 — AI and Machine Learning Foundations

Catalog Description

Conceptual and practical introduction to AI and machine learning designed for future technology leaders. Students learn how AI models work, gain hands-on experience training and evaluating models, and develop judgment about when and how AI should be deployed. The second half extends into modern AI application patterns — large language models, agentic systems, and AI composition via APIs. The course emphasizes intuition, evaluation, and practical application over mathematical derivation. Students work with real datasets using standard ML libraries, while also engaging critically with questions of fairness, bias, and organizational readiness for AI adoption.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 110 (Computational Thinking and Programming), MATH 151 (Calculus I) or STAT 201 (Introduction to Statistics)
Semester	Year 2, Fall
Format	Two 50-minute lectures + one 75-minute lab per week
Contact Hours	175 minutes/week (43.75 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Explain** core machine learning paradigms — supervised, unsupervised, reinforcement learning, and generative AI — and identify appropriate applications for each (Understand)
2. **Train and evaluate** machine learning models using standard ML libraries, selecting appropriate algorithms and metrics for given problem types (Apply)
3. **Assess** model performance, fairness, and limitations using appropriate evaluation frameworks and articulate trade-offs to non-technical stakeholders (Evaluate)
4. **Analyze** the complete data pipeline — collection, cleaning, feature engineering, labeling — and its impact on model outcomes and potential biases (Analyze)
5. **Design** a comprehensive AI project proposal incorporating problem definition, data strategy, model selection, evaluation plan, and risk assessment (Create)

Weekly Topic Outline

Week	Topic	Lab / Activities
1	The AI landscape: history, hype cycles, and reality	Lab: Environment setup; exploring ML datasets; Mitchell Ch 1-3
2	Data foundations: types, quality, and bias	Lab: Data exploration and cleaning with pandas; identifying bias in datasets
3	Supervised learning I: regression and classification	Lab: Linear regression and logistic classification with scikit-learn; Geron Ch 1-4 (selected)
4	Supervised learning II: trees, forests, and evaluation metrics	Lab: Decision trees, random forests; precision, recall, F1, confusion matrices
5	Unsupervised learning: clustering and dimensionality reduction	Lab: K-means clustering, PCA; customer segmentation exercise
6	Neural networks: conceptual foundations + Keras introduction	Lab: Building a simple neural network in Keras; Geron Ch 10 (selected)
7	**Midterm: practical exam + quiz**	Practical: train and evaluate a model on a novel dataset; Quiz: conceptual questions
8	NLP fundamentals: text as data	Lab: Text preprocessing, sentiment analysis, TF-IDF, word embeddings
9	Computer vision fundamentals: images as data	Lab: Image classification with CNNs; transfer learning exercise
10	Large language models and generative AI	Lab: Working with LLM APIs; prompt engineering exercises; understanding tokens, context, hallucination
11	AI application patterns: retrieval-augmented generation, agentic systems, tool use	Lab: Building an AI application that composes models and APIs; evaluating system outputs
12	Fairness, bias, and responsible AI	Lab: AI audit exercise — auditing a model for fairness; Barocas/Hardt/Narayanan Ch 1-3
13	AI project management: scoping, MLOps, and organizational readiness	Lab: Scoping an AI project; data requirements; infrastructure considerations
14	Final project working sessions	Team workshops; project refinement; peer feedback sessions
15	**Final presentations: AI project proposals**	Team presentations with Q&A from faculty and guest evaluators

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Lab exercises (x8)	20%	Hands-on coding labs with deliverables submitted as Jupyter notebooks; graded on correctness, code quality, and interpretation of results	PLO-5, PLO-3
Homework assignments (x3)	15%	Individual assignments combining technical implementation with written analysis of model choices and trade-offs	PLO-5, PLO-8
Midterm (practical + quiz)	15%	Practical component: train and evaluate a model on an unseen dataset within lab time; Quiz: conceptual understanding of ML paradigms and evaluation	PLO-5
AI audit exercise	15%	Individual or pair analysis of a pre-trained model examining performance across demographic groups, identifying biases, and recommending mitigations	PLO-8, PLO-3
Final AI project proposal (team)	30%	Team of 3-4 develops a comprehensive AI project proposal including problem definition, data strategy, model selection rationale, evaluation plan, fairness considerations, and risk assessment; delivered as written report + presentation	PLO-5, PLO-8, PLO-3
Peer review	5%	Structured peer feedback on another team's project proposal, assessed on quality and constructiveness of feedback	PLO-5

Required Readings

- Geron, A. (2022). *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*. 3rd edition. O'Reilly Media. Selected chapters as noted in weekly schedule.
- Mitchell, M. (2019). *Artificial Intelligence: A Guide for Thinking Humans*. Farrar, Straus and Giroux.
- Barocas, S., Hardt, M., & Narayanan, A. (2023). *Fairness and Machine Learning: Limitations and Opportunities*. MIT Press. Chapters 1-3. Available free online at fairmlbook.org.

Recommended Readings

- Chollet, F. (2021). *Deep Learning with Python*. 2nd edition. Manning Publications.
- Russell, S. & Norvig, P. (2021). *Artificial Intelligence: A Modern Approach*. 4th edition. Pearson. Selected chapters on search, learning, and ethics.

Connection to Program Learning Outcomes

PLO	Alignment	Contribution
PLO-5: Technology Fluency	**Primary**	Students develop deep practical fluency with AI/ML tools, workflows, and evaluation methods. They learn to train models, interpret results, and make informed technical decisions about AI adoption.
PLO-8: Appraise Emerging Technologies	**Secondary**	Students develop the technical understanding needed to evaluate AI systems' capabilities, limitations, and appropriate applications — building the foundation for technology assessment in later courses.
PLO-3: Policy and Governance Literacy	**Secondary**	Students examine the regulatory landscape surrounding AI deployment, connecting technical capabilities to emerging governance frameworks like the EU AI Act and NIST AI RMF.

Course Policies

- **Lab Attendance**: Lab sessions are mandatory. Students who miss a lab must complete the exercise independently and submit within 48 hours.
- **Computing Environment**: All labs use Python in Jupyter notebooks. A pre-configured cloud environment (Google Colab or university JupyterHub) is provided; no local setup required.
- **AI Tool Use**: Students may use AI coding assistants (GitHub Copilot, ChatGPT) for debugging and exploration but must be able to explain all code they submit. Homework includes oral explanation components.
- **Late Work**: Lab exercises lose 10% per day late. Final project deadlines are firm due to presentation scheduling.
- **Academic Integrity**: Code sharing between teams is prohibited on individual assignments. All external code must be attributed.

Technology Requirements

- Python 3.x with standard ML and data science libraries (provided via cloud environment; specific libraries updated annually)
- Access to LLM APIs (provided via course API keys)
- Jupyter Notebook environment (Google Colab or university JupyterHub)
- GitHub account for version control and submission

TSI 220 — Design and Prototyping for Technology Leaders

Catalog Description

Intermediate design and prototyping course bridging foundational design thinking (TSI 120) and concentration-level design specialization. Students develop digital prototyping skills using Figma, learn interaction design and information architecture principles, and practice structured usability evaluation. Topics include responsive design, designing for AI-powered interfaces, design systems, accessibility foundations, service design, and ethical considerations including dark patterns and persuasive design. A semester-long team project requires students to redesign an existing digital product or service through the full design process from research through high-fidelity prototype with usability validation.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 120
Semester	Year 2, Fall
Format	Studio — one 3-hour session per week (lecture + hands-on workshop)
Contact Hours	180 minutes/week (45 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Create** interactive digital prototypes using Figma with appropriate fidelity for different design stages *(Create)*
2. **Apply** information architecture and interaction design principles to organize complex information and workflows *(Apply)*
3. **Evaluate** digital products for usability, accessibility, and ethical design using structured methods *(Evaluate)*
4. **Design** a service blueprint mapping the end-to-end experience of a technology-enabled service *(Create)*
5. **Critique** peer design work constructively using design vocabulary and evidence-based reasoning *(Analyze/Evaluate)*

Weekly Topic Outline

Week	Topic	Key Activities
1	From design thinking to design execution: course overview and Figma setup	Figma orientation; audit an existing digital product for design strengths and weaknesses
2	Information architecture: organizing content and navigation	Card sorting exercise; create a site map and navigation structure for team project
3	Interaction design principles: affordances, feedback, and mental models	Redesign a confusing interaction flow; annotate design decisions with principles
4	Figma deep dive I: components, auto-layout, and design tokens	Workshop: build a small component library; practice responsive layout with auto-layout
5	User research synthesis and persona refinement	Conduct contextual inquiry for team project; synthesize findings into design requirements
6	Wireframing and low-fidelity prototyping	Workshop: rapid wireframing; paper prototype testing with peers
7	**Midterm: Design critique of wireframe prototypes**	Teams present wireframes; structured design critique with instructor and peer feedback
8	Figma deep dive II: interactive prototyping and micro-interactions	Workshop: build interactive prototypes with transitions, overlays, and scroll behaviors
9	Responsive design and designing for multiple platforms	Adapt team prototypes for mobile; discuss platform-specific design patterns
10	Designing for AI-powered interfaces: conversational UI, recommendations, and transparency	Design an AI feature with appropriate transparency and user control
11	Service design: service blueprints and journey mapping	Workshop: create a service blueprint for team project; map frontstage and backstage
12	Accessibility foundations: WCAG principles and inclusive design	Accessibility audit of team prototypes; remediate identified issues
13	Design ethics: dark patterns, persuasive design, and designer responsibility	Dark pattern identification exercise; ethical design review of team projects
14	Usability testing: planning, conducting, and reporting	Conduct moderated usability tests of team prototypes; synthesize findings
15	Final presentations and design portfolio assembly	Teams present final redesign prototypes with research evidence and usability results

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Weekly design exercises	15%	Hands-on exercises practicing specific design skills (IA, interaction design, Figma techniques)	PLO-2
Design critique participation	10%	Quality of feedback given and received during structured design critique sessions	PLO-6, PLO-2
Midterm wireframe presentation	15%	Team presentation of wireframe prototypes with rationale grounded in research and design principles	PLO-2, PLO-6
Service blueprint	10%	Individual service blueprint mapping a technology-enabled service end-to-end	PLO-2
Usability test report	10%	Team usability test plan, execution, and findings report with design recommendations	PLO-2, PLO-3
Final redesign project (portfolio artifact)	35%	Team high-fidelity interactive prototype with research documentation, design rationale, accessibility audit, and usability validation	PLO-2, PLO-3, PLO-6
Participation	5%	Active engagement in studio sessions, workshops, and peer feedback	PLO-6

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Greever, T. (2022). *Articulating Design Decisions: Communicate with Stakeholders, Keep Your Sanity, and Deliver the Best User Experience* (2nd Edition). O'Reilly Media.
- Johnson, J. (2020). *Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Guidelines* (3rd Edition). Morgan Kaufmann.
- Krug, S. (2014). *Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability* (3rd Edition). New Riders.
- W3C. (2023). *Web Content Accessibility Guidelines (WCAG) 2.2 Quick Reference.* https://www.w3.org/WAI/WCAG22/quickref/

Recommended Readings

- Stickdorn, M., Hormess, M. E., Lawrence, A., & Schneider, J. (2018). *This Is Service Design Doing*. O'Reilly Media.
- Brignull, H. (2023). *Deceptive Patterns: Exposing the Tricks Tech Companies Use to Control You*. Testimonium Ltd.
- Cooper, A., Reimann, R., Cronin, D., & Noessel, C. (2014). *About Face: The Essentials of Interaction Design* (4th Edition). Wiley.
- Rosenfeld, L., Morville, P., & Arango, J. (2015). *Information Architecture: For the Web and Beyond* (4th Edition). O'Reilly Media.

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-2: Design Technology-Enabled Solutions (Primary)	Students develop intermediate design and prototyping skills through Figma, applying information architecture, interaction design, service design, and usability evaluation methods. The semester-long redesign project is the primary vehicle for PLO-2 development in the core curriculum.
PLO-3: Construct Evidence-Based Arguments (Secondary)	Students evaluate digital products for ethical design (dark patterns, persuasive design) and accessibility compliance, constructing evidence-based arguments about design responsibilities and governance.
PLO-6: Communicate Complex Technical Concepts (Secondary)	Design critique sessions, client-style presentations, and the articulation of design decisions develop students' ability to communicate complex design rationale to diverse audiences.

Course Policies

- **Attendance:** Students are expected to attend all sessions. More than three unexcused absences may result in a reduced participation grade. Studio sessions are especially difficult to make up due to their hands-on and collaborative nature.
- **Late Work:** Assignments submitted late without prior arrangement will be penalized 5% per day, up to a maximum of 25%.
- **Academic Integrity:** All work must be original. Proper citation is required for all sources. Use of generative AI tools must be disclosed and is permitted only for brainstorming and ideation, not for producing submitted design deliverables.
- **Software:** Students must have access to Figma (free education plan available). All other tools used in the course are freely available.

- **Accessibility:** Students requiring accommodations should contact the instructor and the Office of Disability Services within the first two weeks of the semester.

TSI 230 — Technology Policy and Regulation

Catalog Description

Examination of how governments and industry regulate technology across domains including AI, data protection, cybersecurity, biotechnology, and climate technology. Students study the policymaking process, analyze major regulatory frameworks, and develop skills in policy analysis and advocacy. The course features policy simulations where students represent diverse stakeholders — legislators, regulators, industry executives, civil society advocates — and guest appearances by practicing policymakers. Students produce a substantive policy brief as a portfolio artifact.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 130 (Ethics of Technology)
Semester	Year 2, Spring
Format	Two 75-minute sessions per week (seminar + simulation/workshop)
Contact Hours	150 minutes/week (37.5 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Describe** the technology policymaking process in the United States and internationally, identifying key institutions, actors, and mechanisms of influence (Understand)
2. **Analyze** existing technology regulations — including GDPR, the EU AI Act, Section 230, and antitrust actions — evaluating their design, effectiveness, and unintended consequences (Analyze)
3. **Evaluate** competing policy proposals using structured criteria including feasibility, proportionality, innovation impact, rights protection, and enforcement mechanisms (Evaluate)
4. **Construct** a professional policy brief recommending a governance approach for an emerging technology challenge, supported by evidence and stakeholder analysis (Create)
5. **Participate** effectively in policy simulations, representing diverse stakeholder perspectives and negotiating toward actionable outcomes (Apply)

Weekly Topic Outline

Week	Topic	Activities & Readings
1	The technology policymaking landscape	Overview of regulatory institutions (FTC, FCC, NTIA, EU Commission); Thierer selected chapters; how a tech bill becomes law
2	Regulatory theory: when and how to regulate	Market failure, precautionary vs. permissionless innovation, co-regulation models; memo 1 assigned
3	Data protection: GDPR and CCPA	Deep dive into GDPR architecture, rights framework, enforcement; CCPA comparison; Solove Ch 1-2; primary source: GDPR excerpts
4	Platform regulation: Section 230 and content moderation	History and evolution of Section 230; content moderation at scale; primary source: Section 230 text; Gillespie selection
5	Antitrust in technology markets	Market definition in digital markets, platform dominance, remedies; case studies: Google, Apple, Amazon actions
6	**Policy simulation I: Congressional hearing on platform regulation**	Students assigned roles (legislators, tech executives, civil society, academics); preparation + simulation + debrief
7	**Midterm analysis paper due**	In-class workshop: peer review of draft papers; Solove Ch 3-4
8	AI regulation: the EU AI Act and NIST AI RMF	Risk-based classification, prohibited uses, compliance requirements; primary sources: EU AI Act excerpts, NIST AI RMF
9	Cybersecurity policy	Critical infrastructure protection, breach notification, cyber norms; NIST Cybersecurity Framework; Brookings selections
10	Intellectual property in the digital age	Copyright and AI-generated content, patent trolls, open source licensing, trade secrets; ITIF selections
11	International technology governance and emerging domains	Digital sovereignty, US-EU-China divergence, Brussels Effect; governance of biotechnology, climate technology, and other frontier domains; course packet readings
12	Industry self-regulation and multi-stakeholder governance	Voluntary commitments, industry standards, trust and safety teams; comparing governance models across AI, biotech, and climate tech; AI Now selections
13	**Policy simulation II: Multi-stakeholder negotiation on AI governance**	Multi-party negotiation exercise; students represent governments, industry, civil society, academia across jurisdictions

Week	Topic	Activities & Readings
14	Policy brief workshop	Peer review of draft briefs; revision strategies; writing for policymaker audiences
15	**Final presentations: policy brief pitches**	Students present policy brief recommendations; Q&A from faculty and guest policymakers

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Regulatory analysis memos (x6)	15%	Short analytical memos (500-750 words each) examining a specific regulation or policy proposal using structured criteria	PLO-3, PLO-6
Policy simulations (x2) + reflections	15%	Active participation in two simulations (Congressional hearing, multi-stakeholder negotiation) plus post-simulation reflection papers (750 words each)	PLO-3, PLO-7
Midterm analysis paper	20%	Individual paper (2,000 words) analyzing a current technology regulation — its design, effectiveness, and reform options	PLO-3, PLO-6
Policy brief (portfolio artifact)	30%	Individual policy brief (3,000 words) recommending a governance approach for an emerging technology challenge; includes stakeholder analysis, evidence review, and implementation plan	PLO-3, PLO-6, PLO-7
Final presentation	15%	10-minute presentation of policy brief recommendations to faculty and guest evaluators, followed by Q&A	PLO-3, PLO-7
Class participation	5%	Engagement in seminar discussions, preparation for simulations, and constructive feedback during workshops	PLO-3

Required Readings

- Thierer, A. (2020). *Evasive Entrepreneurs and the Future of Governance*. Cato Institute. Selected chapters.
- Solove, D. (2008). *Understanding Privacy*. Harvard University Press. Chapters 1-4.

- Primary source documents (provided via LMS):
    - EU AI Act: selected articles and annexes
    - NIST AI Risk Management Framework (AI RMF 1.0)
    - Section 230 of the Communications Decency Act (full text)
    - GDPR: selected articles and recitals
- Course packet: selected policy papers from Brookings Institution, Information Technology and Innovation Foundation (ITIF), and AI Now Institute.

Recommended Readings

- Lessig, L. (2006). *Code: Version 2.0*. Basic Books.
- Gillespie, T. (2018). *Custodians of the Internet: Platforms, Content Moderation, and the Hidden Decisions That Shape Social Media*. Yale University Press.

Connection to Program Learning Outcomes

PLO	Alignment	Contribution
PLO-3: Policy and Governance Literacy	**Primary**	This course is the program's core offering in technology policy. Students develop the analytical frameworks, domain knowledge, and practical skills needed to engage with technology regulation as informed professionals — whether as advocates, compliance officers, or technology leaders navigating regulatory environments.
PLO-6: Communication	**Secondary**	The policy brief, regulatory memos, and final presentation develop professional communication skills for policy audiences. Students learn to write clearly for policymakers and to present evidence-based recommendations persuasively.
PLO-7: Leadership and Collaboration	**Secondary**	Policy simulations require students to represent stakeholder positions, negotiate across interests, and work toward actionable compromises — core leadership competencies for technology professionals operating in multi-stakeholder environments.

Course Policies

- **Simulation Preparation**: Students receive role assignments one week before each simulation and must submit a preparation brief (1 page) demonstrating understanding of their assigned stakeholder position.
- **Guest Speakers**: The course features 2-3 guest policymakers (legislators, regulators, industry policy leads). Attendance and engagement during guest sessions is expected.

- **Current Events**: Students should follow technology policy news (suggested sources: Platformer, The Verge policy coverage, Lawfare, Brookings TechStream) and be prepared to discuss current developments.
- **Late Work**: Memos lose one letter grade per day late. The midterm paper and policy brief have firm deadlines; extensions require advance approval.
- **Academic Integrity**: Policy briefs must be original analytical work. AI tools may be used for research assistance but not for drafting the brief. All sources must be properly cited.
- **Writing Support**: Students are encouraged to use the university writing center for policy brief drafts. The Week 14 peer review workshop provides structured feedback opportunities.

TSI 240 — Innovation and Entrepreneurship

Catalog Description

Innovation theory and entrepreneurial practice in both startup and corporate contexts. Students move from idea generation through customer discovery, lean startup methodology, MVP development, and business model iteration. Covers innovation theory (Schumpeter, Christensen), the jobs-to-be-done framework, design sprints, intellectual property basics, and innovation portfolio management. Teams develop and pitch a technology venture concept through iterative customer validation cycles.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 140
Semester	Year 2, Fall
Format	Two 75-minute sessions per week (lecture + workshop/team exercises)
Contact Hours	150 minutes/week (37.5 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Analyze** innovation types (disruptive, sustaining, architectural) and explain their strategic implications using established theoretical frameworks *(Analyze)*
2. **Apply** lean startup methodology — including customer discovery, hypothesis testing, and pivoting — to validate a technology venture concept *(Apply)*
3. **Design** a minimum viable product strategy appropriate to the stage of venture development and available resources *(Create)*
4. **Construct** and iterate a business model canvas based on evidence gathered from customer interviews and market analysis *(Apply/Create)*
5. **Evaluate** innovation strategies in corporate contexts, distinguishing between exploration and exploitation approaches *(Analyze)*
6. **Deliver** a compelling venture pitch that communicates value proposition, market opportunity, and go-to-market strategy *(Apply)*

Weekly Topic Outline

Week	Topic	Key Activities
1	Innovation theory: Schumpeter, creative destruction, and innovation types	Map historical waves of innovation; classify innovations by type
2	Disruptive innovation (Christensen): theory and critique	Case: Netflix vs. Blockbuster; debate the limits of disruption theory
3	Customer discovery I: problem-solution fit (Blank)	Workshop: identify assumptions; design customer interview scripts
4	Customer discovery II: getting out of the building	Conduct first round of customer interviews; synthesize findings
5	Jobs-to-be-done framework and value proposition design	JTBD analysis exercise; map functional, social, and emotional jobs
6	Lean startup methodology: build-measure-learn (Ries)	Hypothesis board workshop; define MVPs for team ventures
7	**Midterm: Customer discovery report and pivot-or-persevere decision**	Teams present customer discovery findings and defend their strategic direction
8	MVP strategies: concierge, Wizard of Oz, landing page, prototype	Design sprint: teams develop MVP strategy for their ventures
9	Business model canvas: iteration and validation	Canvas workshop; compare revenue model options; unit economics basics
10	Ten types of innovation (Keeley) and innovation portfolios	Innovation audit exercise; map an incumbent's innovation portfolio
11	Corporate innovation: intrapreneurship, labs, and ambidexterity	Case: Google X and innovation theater vs. real innovation
12	Intellectual property: patents, trade secrets, and open innovation	IP strategy exercise; debate open vs. closed innovation approaches
13	Pitch development: storytelling, structure, and delivery	Pitch workshop with iterative feedback; study effective pitch decks
14	Venture pitch presentations	Teams deliver final pitches to a panel including external entrepreneurs
15	Synthesis: the innovation mindset and your career	Integrative discussion; portfolio reflection; innovation journal review

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Innovation journal	10%	Weekly reflections connecting innovation concepts to observed real-world examples	PLO-4
Customer discovery report	20%	Team report documenting customer interviews, key insights, assumptions tested, and pivot decisions	PLO-4, PLO-2
Business model canvas iterations (x3)	15%	Three progressively refined business model canvases with evidence annotations	PLO-4, PLO-2
Midterm pivot-or-persevere presentation	15%	Team presentation of customer discovery findings with defended strategic recommendation	PLO-4, PLO-6, PLO-7
Final venture pitch (portfolio artifact)	30%	Team pitch presentation and supporting materials (pitch deck, financial sketch, MVP plan)	PLO-4, PLO-2, PLO-6, PLO-7
Peer evaluation of teamwork	5%	Structured peer assessment of individual contributions to team venture work	PLO-7
Participation	5%	Active engagement in workshops, discussions, and peer feedback	PLO-6

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Ries, E. (2011). *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. Crown Business. Chapters 1-8.
- Blank, S., & Dorf, B. (2020). *The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company* (2nd Edition). Wiley. Selected chapters: 1-3, 5, 7.
- Christensen, C. M. (2016). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail* (Reprint Edition). Harvard Business Review Press. Chapters 1-4, 9-10.
- Keeley, L., Walters, H., Pikkel, R., & Quinn, B. (2013). *Ten Types of Innovation: The Discipline of Building Breakthroughs*. Wiley.

Recommended Readings

- Osterwalder, A., & Pigneur, Y. (2010). *Business Model Generation*. Wiley.
- Ulwick, A. W. (2016). *Jobs to Be Done: Theory to Practice*. Idea Bite Press.
- Aulet, B. (2013). *Disciplined Entrepreneurship: 24 Steps to a Successful Startup*. Wiley.
- O'Reilly, C. A., & Tushman, M. L. (2016). *Lead and Disrupt: How to Solve the Innovator's Dilemma*. Stanford Business Books.

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-4: Formulate and Execute Innovation Strategies (Primary)	Students develop, validate, and iterate innovation strategies through the full lean startup cycle, from customer discovery through venture pitch. The course is the primary vehicle for PLO-4 development in the core curriculum.
PLO-2: Design Technology-Enabled Solutions (Secondary)	MVP design, value proposition development, and business model iteration require students to design solutions that address validated customer needs.
PLO-7: Lead Cross-Functional Teams (Secondary)	Semester-long team venture work, including rotating leadership roles in customer discovery sprints, develops collaborative leadership skills.

Course Policies

- **Attendance:** Students are expected to attend all sessions. More than three unexcused absences may result in a reduced participation grade.
- **Late Work:** Assignments submitted late without prior arrangement will be penalized 5% per day, up to a maximum of 25%.
- **Academic Integrity:** All work must be original. Proper citation is required for all sources. Use of generative AI tools must be disclosed and is permitted only for brainstorming, not for producing submitted text.
- **Accessibility:** Students requiring accommodations should contact the instructor and the Office of Disability Services within the first two weeks of the semester.

TSI 250 — Leadership in Technical Organizations

Catalog Description

Develops the leadership capabilities essential for technology professionals operating in complex, ambiguous, and rapidly changing environments. Students study adaptive leadership, facilitation, negotiation, conflict resolution, psychological safety, and leading through uncertainty. The course is heavily experiential, featuring simulations, role-plays, coached feedback sessions, and a 360-degree assessment. Students synthesize their growth into a personal leadership development plan that serves as a portfolio artifact.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 120 (Human-Centered Design)
Semester	Year 2, Spring
Format	One 75-minute session (theory/seminar) + one 75-minute session (workshop/experiential) per week
Contact Hours	150 minutes/week (37.5 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Explain** major leadership theories — adaptive, servant, transformational, and situational — and their relevance to technical organizations (Understand)
2. **Apply** facilitation techniques to effectively lead meetings, workshops, and group decision-making processes (Apply)
3. **Demonstrate** negotiation and conflict resolution skills through structured role-play scenarios with coached feedback (Apply)
4. **Analyze** one's own leadership style, strengths, and growth areas through 360-degree assessment data and structured self-reflection (Analyze)
5. **Design** a personal leadership development plan with specific goals, strategies, and accountability mechanisms (Create)

Weekly Topic Outline

Week	Topic	Activities & Readings
1	What is leadership? Models, myths, and the tech leadership challenge	Seminar: leadership theory overview; Workshop: leadership autobiography exercise; Heifetz Ch 1-3
2	Adaptive leadership: leading without authority	Seminar: Heifetz framework — technical vs. adaptive challenges; Workshop: diagnosing adaptive challenges in case scenarios
3	Psychological safety and high-performing teams	Seminar: Edmondson's research and framework; Workshop: team diagnostic exercise; Edmondson Ch 1-4
4	Facilitation fundamentals	Seminar: facilitation theory and meeting design; Workshop: facilitation practicum — each student leads a 15-minute facilitated discussion
5	Communication for influence	Seminar: persuasion, framing, storytelling for leaders; Workshop: elevator pitch and executive briefing exercises; Fisher/Ury Ch 1-3
6	Negotiation simulation I: two-party negotiation	Seminar: principled negotiation (Fisher/Ury); Workshop: two-party negotiation role-play with coached debrief
7	Leading through ambiguity and complexity	Seminar: Cynefin framework, VUCA, decision-making under uncertainty; Workshop: ambiguity simulation — leading a team through an evolving crisis
8	360-degree assessment debrief and coaching	Seminar: interpreting 360 feedback, growth mindset; Workshop: individual coaching sessions (rotating with peer exercises); Heifetz Ch 7-9
9	Conflict resolution in technical teams	Seminar: conflict styles, constructive disagreement, repair; Workshop: conflict resolution role-play with video debrief
10	Cross-functional leadership	Seminar: leading without positional authority, influence across silos; Workshop: cross-functional simulation — leading a product launch team; Edmondson Ch 5-7
11	Leading organizational change	Seminar: Kotter's 8-step model, change resistance; Workshop: change management case — planning a technology transformation
12	Negotiation simulation II: multi-party negotiation	Seminar: coalition building, multi-party dynamics; Workshop: multi-party negotiation role-play (4-6 parties) with coached debrief

Week	Topic	Activities & Readings
13	Ethics of leadership and power	Seminar: ethical leadership, power dynamics, responsible use of influence; Workshop: ethical dilemma scenarios in tech leadership contexts
14	Personal leadership development plan presentations	Workshop: students present draft development plans; peer and faculty feedback; revision guidance
15	Synthesis: leadership identity and the road ahead	Seminar: integrating theory, experience, and feedback; Workshop: leadership identity reflection and course celebration

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Facilitation practicum	15%	Each student designs and leads a 15-minute facilitated discussion on an assigned topic; assessed on preparation, technique, group engagement, and time management	PLO-7, PLO-6
Negotiation simulations (x2) + reflections	15%	Active participation in two negotiation role-plays (two-party and multi-party) plus post-simulation reflection papers (750 words each) analyzing strategy, outcomes, and lessons learned	PLO-7
360-degree assessment + self-analysis	15%	Completion of 360-degree feedback process (self, peers, and external raters) plus a structured self-analysis paper (1,500 words) interpreting results and identifying development priorities	PLO-7, PLO-6
Leadership journal (x10 weekly entries)	15%	Reflective journal entries connecting course concepts to personal leadership experiences; entries are 300-500 words each, submitted weekly	PLO-7
Personal leadership development plan (portfolio artifact)	25%	Comprehensive development plan including leadership philosophy statement, strengths/growth areas analysis based on 360 data, specific development goals with strategies and timelines, and accountability mechanisms	PLO-7, PLO-6
Team effectiveness peer evaluation	10%	Structured peer evaluation of contributions to team exercises and simulations throughout the semester;	PLO-7

Assessment	Weight	Description	PLO Mapping
		includes both quantitative ratings and qualitative feedback	
Participation	5%	Active engagement in seminars, workshops, role-plays, and feedback sessions; quality of contributions to peer learning	PLO-7

Required Readings

- Heifetz, R., Grashow, A., & Linsky, M. (2009). *The Practice of Adaptive Leadership: Tools and Tactics for Changing Your Organization and the World*. Harvard Business Press. Selected chapters as noted in weekly schedule.
- Edmondson, A. (2018). *The Fearless Organization: Creating Psychological Safety in the Workplace for Learning, Innovation, and Growth*. Wiley.
- Fisher, R. & Ury, W. (2011). *Getting to Yes: Negotiating Agreement Without Giving In*. 3rd edition. Penguin Books.

Recommended Readings

- Sinek, S. (2014). *Leaders Eat Last: Why Some Teams Pull Together and Others Don't*. Portfolio/Penguin.
- Schwarz, R. (2016). *The Skilled Facilitator: A Comprehensive Resource for Consultants, Facilitators, Coaches, and Trainers*. 3rd edition. Jossey-Bass.

Connection to Program Learning Outcomes

PLO	Alignment	Contribution
PLO-7: Leadership and Collaboration	**Primary**	This course is the program's dedicated leadership development offering. Through theory, experiential exercises, coached feedback, and structured reflection, students develop the adaptive leadership, facilitation, negotiation, and conflict resolution skills essential for leading in technical organizations.
PLO-6: Communication	**Secondary**	Leadership is enacted through communication. The facilitation practicum, negotiation simulations, executive briefing exercises, and development plan presentations all build students' ability to communicate effectively in leadership contexts — persuading, listening, framing, and delivering difficult messages.

Course Policies

- **Experiential Participation**: This course requires full engagement in all experiential activities including role-plays, simulations, and feedback sessions. Students who are unable to participate in a workshop session must arrange an alternative experiential activity with the instructor.
- **360-Degree Assessment**: The 360 process involves self-assessment plus feedback from 4-6 peers (classmates and project partners from other courses). All feedback is confidential and aggregated. Students must complete both giving and receiving feedback to earn full credit.
- **Confidentiality**: Personal reflections shared in workshops and journal entries are treated as confidential within the course community. Students are expected to maintain this trust.
- **Video Recording**: Select workshop sessions may be video recorded for individual review and coaching purposes. Recordings are available only to the individual student and instructor and are deleted at semester end.
- **Late Work**: Journal entries are not accepted late (they are time-bound reflections). Reflection papers receive a half-letter grade deduction per day late. The development plan deadline is firm due to presentation scheduling.
- **Academic Integrity**: Leadership journals and reflection papers must represent authentic personal reflection. AI tools should not be used for reflective writing in this course.

Technology Requirements

- 360-degree feedback platform (provided by the program)
- Video recording equipment for select workshop sessions (provided in classroom)
- LMS for journal submissions and peer feedback

TSI 310 — Complex Adaptive Systems

Catalog Description

Advanced systems thinking for technology leaders. Students engage with complexity theory, network science, agent-based modeling, emergence, and resilience as applied to technology ecosystems, organizational dynamics, and societal technology transitions. Building on foundations from TSI 101 and TSI 210, this course develops sophisticated analytical capabilities through computational modeling. Students build agent-based and network models to explore emergent phenomena in sociotechnical systems, culminating in a research-quality systems analysis.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 210
Semester	Year 3, Fall
Format	Two 75-minute sessions per week (seminar + computational workshop)
Contact Hours	150 minutes/week (37.5 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Analyze** technology ecosystems as complex adaptive systems, identifying emergent properties, feedback loops, and leverage points *(Analyze)*
2. **Evaluate** the resilience and fragility of sociotechnical systems using network science metrics and complexity frameworks *(Evaluate)*
3. **Construct** agent-based models to simulate emergent behavior in technology adoption, organizational dynamics, or market evolution *(Create)*
4. **Apply** network science concepts (scale-free networks, small worlds, centrality) to analyze the structure and vulnerability of real technology networks *(Apply)*
5. **Synthesize** the multi-level perspective on transitions (Geels) with complexity theory to assess ongoing technology transitions such as AI diffusion and energy transformation *(Evaluate/Create)*

Weekly Topic Outline

Week	Topic	Key Activities
1	Complexity science foundations: the Santa Fe Institute tradition	Explore simple rules producing complex behavior; cellular automata workshop
2	Emergence and self-organization	Workshop: Conway's Game of Life and Schelling's segregation model in NetLogo
3	Network science I: graphs, degree distributions, small worlds (Barabasi)	Lab: build and analyze network graphs using NetworkX; compute basic metrics
4	Network science II: scale-free networks, preferential attachment, centrality	Lab: analyze a real technology network (open-source dependencies, social media)
5	Agent-based modeling I: principles and NetLogo fundamentals	Lab: build a basic agent-based model; explore parameter sensitivity
6	Agent-based modeling II: modeling technology diffusion	Lab: extend Rogers diffusion model as ABM; compare to analytical models
7	**Midterm: Network analysis of a technology ecosystem**	Individual presentations of network analyses with interpretation of structural properties
8	Resilience, tipping points, and regime shifts	Cases: cascading failures in energy grids and infrastructure networks; resilience assessment exercise
9	Wicked problems and systemic intervention	Wicked problem mapping workshop; identify leverage points (Meadows, revisited)
10	Multi-level perspective on transitions (Geels) — advanced treatment	Apply MLP to energy transitions and AI diffusion; compare niche, regime, and landscape dynamics
11	Platform and biological ecosystems as complex adaptive systems	Compare platform dynamics with synthetic biology ecosystems; model emergent behaviors
12	Co-evolution of technology and institutions	Cases: cryptocurrency governance, pandemic response networks, and climate technology coordination
13	Computational modeling workshop: final project development	Workshop sessions; peer review of model designs and preliminary results
14	Student research presentations	Teams present systems analyses with computational models to seminar
15	Synthesis: complexity-informed technology leadership	Integrative discussion; implications for strategy, policy, and design

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Weekly reading responses	10%	Critical reflections (400-500 words) engaging with complexity and network science literature	PLO-1
Network analysis exercises (x2)	15%	Two computational network analyses of real technology ecosystems with written interpretation	PLO-1, PLO-5
Agent-based modeling labs (x3)	15%	Three progressively complex ABM exercises in NetLogo with documentation and analysis	PLO-5, PLO-1
Midterm network analysis presentation	20%	Individual network analysis of a technology ecosystem with structural interpretation and implications	PLO-1, PLO-5, PLO-8
Final systems analysis project (portfolio artifact)	35%	Team research project analyzing a technology ecosystem as a complex adaptive system, including computational model, written analysis, and presentation	PLO-1, PLO-5, PLO-8
Participation	5%	Active engagement in seminars, workshops, and peer feedback	PLO-6

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Mitchell, M. (2009). *Complexity: A Guided Tour*. Oxford University Press.
- Barabasi, A.-L. (2016). *Network Science*. Cambridge University Press. Available free at networksciencebook.com. Chapters 1-5, 7, 10.
- Meadows, D. H. (2008). *Thinking in Systems: A Primer*. Chelsea Green Publishing. Chapters 5-7 (extending beyond TSI 101 coverage).
- Geels, F. W. (2019). Socio-technical transitions to sustainability: A review of criticisms and elaborations of the Multi-Level Perspective. *Current Opinion in Environmental Sustainability*, 39, 187-201.

Recommended Readings

- Miller, J. H., & Page, S. E. (2007). *Complex Adaptive Systems: An Introduction to Computational Models of Social Life*. Princeton University Press.
- Newman, M. (2018). *Networks* (2nd Edition). Oxford University Press.
- Holland, J. H. (2014). *Complexity: A Very Short Introduction*. Oxford University Press.
- Wilensky, U., & Rand, W. (2015). *An Introduction to Agent-Based Modeling: Modeling Natural, Social, and Engineered Complex Systems with NetLogo*. MIT Press.

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-1: Evaluate Complex Sociotechnical Systems (Primary)	Students develop advanced systems analysis capabilities, moving beyond the foundational frameworks of TSI 101 to complexity theory, network science, and computational modeling of sociotechnical dynamics. This is the most analytically rigorous treatment of PLO-1 in the core curriculum.
PLO-5: Develop and Deploy Computational Artifacts (Secondary)	Students build functional computational models (agent-based models in NetLogo, network analyses in Python) that produce analytical insights. These are deployable artifacts that demonstrate computational thinking.
PLO-8: Appraise Emerging Technologies (Secondary)	Students apply complexity and network frameworks to assess emerging technologies (AI, platforms, blockchain) as evolving sociotechnical systems, evaluating trajectories, risks, and intervention points.

Course Policies

- **Attendance:** Students are expected to attend all sessions. More than three unexcused absences may result in a reduced participation grade.
- **Late Work:** Assignments submitted late without prior arrangement will be penalized 5% per day, up to a maximum of 25%.
- **Academic Integrity:** All work must be original. Proper citation is required for all sources. Use of generative AI tools must be disclosed and is permitted only for brainstorming, not for producing submitted text.
- **Accessibility:** Students requiring accommodations should contact the instructor and the Office of Disability Services within the first two weeks of the semester.

TSI 311 — Building Intelligent Systems

Catalog Description

Hands-on, project-intensive course in which students design, orchestrate, and deploy AI-native systems. Building on the foundations of TSI 212, this course teaches students to compose AI capabilities into complete systems that solve real problems — the transition from understanding individual models to architecting multi-component intelligent applications. Students work through four month-long project cycles covering AI-powered application design, agentic AI systems, human-AI interaction patterns, and system reliability. Specific tools and frameworks are updated annually to reflect the rapidly evolving landscape; the emphasis is on durable design principles and engineering discipline rather than mastery of any particular platform.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 212 (AI and Machine Learning Foundations), TSI 211 (Data Science for Decision Making)
Semester	Year 3, Spring
Format	One 50-minute lecture + one 110-minute project lab per week
Contact Hours	160 minutes/week (40 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Design** the architecture of a multi-component AI system, selecting and composing pre-trained models, APIs, and custom logic into a coherent solution *(Create)*
2. **Build** agentic AI systems that incorporate tool use, planning, memory, and multi-agent coordination to accomplish complex tasks *(Create)*
3. **Evaluate** AI system outputs for reliability, safety, and fitness for purpose using systematic evaluation frameworks and human-in-the-loop assessment *(Evaluate)*
4. **Deploy** AI-native applications to production environments with appropriate monitoring, safety guardrails, and maintenance procedures *(Apply)*
5. **Analyze** the trade-offs between different AI system architectures (monolithic vs. compositional, autonomous vs. human-in-the-loop, specialized vs. general) for a given problem context *(Analyze)*

Weekly Topic Outline

Week	Topic	Lab / Project Activity
1	From models to systems: the AI systems design landscape	Lab: survey of current AI application architectures; map components of a real AI product
2	Composing AI capabilities: APIs, pre-trained models, and orchestration layers	Project 1 kickoff: design an AI-powered application by composing existing services
3	System architecture patterns: pipelines, chains, routers, and fallbacks	Lab: implement a multi-step AI pipeline with error handling and fallback logic
4	Project 1 working sessions and review	Team presentations: architecture walkthrough and working demo
5	Agentic AI foundations: tool use, planning, and reasoning	Project 2 kickoff: design an agentic system for a defined problem domain
6	Multi-agent coordination: delegation, handoffs, and shared state	Lab: build a multi-agent system with specialized agents coordinating on a task
7	Agent memory, context management, and grounding	Lab: implement persistent memory and retrieval for an agent system
8	**Midterm: Project 2 presentations**	Team presentations: agentic system demo with evaluation of autonomous behavior
9	Human-AI interaction design: when to automate, when to involve humans	Project 3 kickoff: design a human-in-the-loop AI workflow for a high-stakes domain
10	Evaluation frameworks: measuring AI system quality beyond accuracy	Lab: build an evaluation harness; implement automated and human evaluation protocols
11	Safety, guardrails, and failure modes in production AI systems	Lab: implement safety guardrails, content filtering, and graceful degradation
12	Deployment, monitoring, and maintenance of AI systems	Project 4: deploy a system to a staging environment with monitoring dashboards
13	AI systems engineering as a discipline: testing, versioning, and technical debt	Lab: implement systematic testing for AI systems; version management for model artifacts
14	Final project working sessions	Workshop sessions; integration testing; peer review
15	**Final project presentations**	Team presentations of complete AI-native systems to faculty and guest evaluators

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Project 1: AI application composition	15%	Team designs and builds an AI application by composing pre-trained models and APIs; graded on architecture quality, functionality, and documentation	PLO-5, PLO-2
Project 2: Agentic AI system	20%	Team designs and builds a multi-agent system with tool use and coordination; graded on system design, autonomous capability, and evaluation rigor	PLO-5, PLO-8
Project 3: Human-AI interaction workflow	15%	Team designs a human-in-the-loop AI workflow for a high-stakes domain; graded on interaction design, safety considerations, and evaluation	PLO-5, PLO-2, PLO-3
Project 4: Deployment and reliability	15%	Individual or pair deploys a system with monitoring, guardrails, and maintenance plan; graded on engineering discipline and documentation	PLO-5
Architecture analysis essays (x2)	15%	Individual written analyses of real-world AI system architectures, evaluating trade-offs and proposing improvements	PLO-5, PLO-8
Final integrated project (portfolio artifact)	15%	Team delivers a complete AI-native system incorporating lessons from all four project cycles; includes working system, technical documentation, and evaluation report	PLO-5, PLO-8, PLO-2
Participation and code review	5%	Active engagement in labs, peer code review quality, and constructive feedback	PLO-6

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Huyen, C. (2022). *Designing Machine Learning Systems*. O'Reilly Media. Selected chapters on system design, deployment, and monitoring.
- Lilian Weng (2023-present). *LLM Powered Autonomous Agents* and related posts at lilianweng.github.io. (Updated readings assigned from current research each semester.)

- Selected papers and technical blog posts on agentic AI architectures, evaluation frameworks, and production AI systems (curated reading list updated annually to reflect the current state of practice).

Recommended Readings

- Kleppmann, M. (2017). *Designing Data-Intensive Applications*. O'Reilly Media. Selected chapters on distributed systems principles.
- Burkov, A. (2020). *Machine Learning Engineering*. True Positive Inc.
- Current documentation for frameworks used in the course (updated annually).

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-5: Develop and Deploy Computational Artifacts (Primary)	This is the most advanced expression of PLO-5 in the core curriculum. Students design, build, deploy, and maintain complete AI-native systems, demonstrating professional-grade engineering skills. The four-project structure ensures breadth across composition, agentic design, human-AI interaction, and production deployment.
PLO-8: Appraise Emerging Technologies (Secondary)	Students critically evaluate AI system architectures, assessing trade-offs between approaches and analyzing the capabilities and limitations of current AI technologies. Architecture analysis essays develop technology assessment skills.
PLO-2: Design Technology-Enabled Solutions (Secondary)	Students apply human-centered design principles when designing human-AI interaction workflows, ensuring that AI system design accounts for user needs, safety, and appropriate levels of autonomy.

Course Policies

- **Attendance:** Lab sessions are mandatory. Students who miss a lab must complete equivalent work independently within one week.
- **Computing Environment:** All labs use a cloud-based development environment provided by the program. Specific tools and frameworks are selected each semester to reflect current industry practice.
- **AI Tool Use:** Students are encouraged to use AI coding assistants throughout the course. All AI-generated code must be reviewed, tested, and understood by the student. Assignments include oral explanation components where students must demonstrate understanding of their system's behavior.

- **Collaboration:** Project work is collaborative. Individual assessments (essays, deployment exercise) must be independent. Code attribution is required for all external sources.
- **Late Work:** Project deadlines are firm due to the sequential project structure. Late submissions lose 10% per day. Extensions require advance arrangement.
- **Academic Integrity:** All submitted work must be original or properly attributed. Students must be able to explain any code in their submissions.

TSI 330 — AI Governance and Responsible Innovation

Catalog Description

The signature course of the B.S. in Technology, Society, and Innovation program. Students operate at the advanced intersection of AI technical knowledge and governance practice, learning to design, implement, and evaluate AI governance mechanisms for real organizations. Topics include risk assessments, algorithmic impact assessments, audit frameworks, transparency mechanisms, and accountability structures. Students produce professional-grade governance artifacts — including a complete algorithmic impact assessment and a comprehensive AI governance program — that demonstrate mastery of the program's distinctive integration of technical fluency, policy literacy, and ethical reasoning. The course draws on frameworks from NIST, ISO, and the EU AI Act while engaging critically with their strengths, limitations, and evolving applicability.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 230 (Technology Policy and Regulation), TSI 212 (AI and Machine Learning Foundations)
Semester	Year 3, Fall
Format	Two 75-minute sessions per week (seminar + practicum)
Contact Hours	150 minutes/week (37.5 hours/semester)
Designation	Signature course of the TSI program

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Evaluate** AI governance frameworks (NIST AI RMF, ISO 42001, EU AI Act) for their strengths, limitations, and applicability to different organizational and sectoral contexts (Evaluate)
2. **Conduct** an algorithmic impact assessment incorporating stakeholder engagement, risk identification, and mitigation planning across technical, social, and legal dimensions (Evaluate/Create)
3. **Design** a comprehensive AI governance program for an organization, including policies, roles and responsibilities, processes, and technical safeguards (Create)
4. **Assess** AI systems for fairness, transparency, accountability, and safety using both technical tools and qualitative evaluation methods (Evaluate)

5. **Synthesize** technical, legal, ethical, and organizational perspectives into coherent, actionable governance recommendations suitable for executive and regulatory audiences (Create)

Weekly Topic Outline

Week	Topic	Activities
1	AI governance landscape: why governance, why now	Seminar: Mapping the governance ecosystem; identifying governance gaps in recent AI incidents
2	AI risk taxonomy: technical, societal, and organizational risks	Practicum: Risk classification exercise using real AI systems; building a risk register
3	Governance frameworks I: NIST AI RMF deep dive	Seminar: Walkthrough of GOVERN, MAP, MEASURE, MANAGE functions; applying RMF to a case
4	Governance frameworks II: EU AI Act — risk classification and compliance	Seminar: Risk tier classification exercises; compliance requirements analysis
5	Governance frameworks III: ISO 42001 and organizational AI management	Practicum: Gap analysis — assessing an organization against ISO 42001 requirements
6	Practicum: Algorithmic impact assessment methodology	Workshop: Stakeholder mapping, risk identification, impact scoring, mitigation design
7	**Midterm: Governance framework comparative analysis**	In-class comparative essay + take-home component
8	Technical governance tools: model cards, datasheets, fairness toolkits	Practicum: Creating model cards and datasheets; using Fairlearn and AIF360
9	Transparency and explainability: approaches and limits	Seminar: SHAP, LIME, counterfactual explanations; limits of interpretability
10	Organizational governance: ethics boards, responsible AI teams, Chief AI Officer	Seminar: Case studies of organizational governance models; role-play exercise
11	Practicum: Designing an AI governance program (team launch)	Workshop: Team formation; sponsor assignment; governance program scoping
12	Sector-specific governance: healthcare AI, financial AI, criminal justice AI	Seminar: Sector case analyses; regulatory landscape comparison
13	International perspectives: China, EU, UK, Singapore approaches	Seminar: Comparative governance analysis; implications for multinational organizations

Week	Topic	Activities
14	Governance for frontier AI: safety evaluations and dangerous capabilities	Seminar: Frontier AI safety frameworks; responsible scaling policies; evaluation methodologies
15	**Final presentations: AI governance program proposals**	Team presentations and defense before faculty and guest evaluators

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Weekly governance briefings (x5)	10%	Short written briefings (500-750 words) analyzing current AI governance developments, policy proposals, or incidents; assessed on analytical depth and connection to course frameworks	PLO-3
Algorithmic impact assessment	25%	Individual portfolio artifact: comprehensive AIA for a real or realistic AI system, including stakeholder analysis, risk identification, impact scoring, mitigation recommendations, and monitoring plan (3000-4000 words + appendices)	PLO-3, PLO-8
Midterm comparative paper	15%	2500-word comparative analysis of two or more governance frameworks applied to a specific AI deployment scenario; assessed on analytical rigor and practical insight	PLO-3, PLO-4
AI governance program design (team)	30%	Team portfolio artifact: comprehensive governance program for a real or realistic organization, including governance charter, policies, risk assessment process, roles and responsibilities, technical safeguards, audit procedures, and implementation roadmap	PLO-3, PLO-8, PLO-4
Final presentation and defense	15%	Team presentation of governance program to faculty and guest evaluators, with Q&A defense of design decisions and trade-offs	PLO-3, PLO-4
Participation	5%	Active engagement in seminars, practica, and peer review activities	PLO-3

Required Readings

- National Institute of Standards and Technology. (2023). *AI Risk Management Framework (AI RMF 1.0)*. NIST AI 100-1. Primary governance reference document.
- European Parliament and Council of the European Union. (2024). *Regulation (EU) 2024/1689 — Artificial Intelligence Act*. Selected articles and annexes as assigned.
- Raji, I. D., Smart, A., White, R. N., Mitchell, M., Gebru, T., Hutchinson, B., Smith-Loud, J., Theron, D., & Barnes, P. (2020). "Closing the AI Accountability Gap: Defining an End-to-End Framework for Internal Algorithmic Auditing." *ACM Conference on Fairness, Accountability, and Transparency (FAccT)*.
- Mitchell, M., Wu, S., Zaldivar, A., Barnes, P., Vasserman, L., Hutchinson, B., Spitzer, E., Raji, I. D., & Gebru, T. (2019). "Model Cards for Model Reporting." *ACM Conference on Fairness, Accountability, and Transparency (FAT)**.

Recommended Readings

- Calo, R. (2017). "Artificial Intelligence Policy: A Primer and Roadmap." *UC Davis Law Review*, 51, 399-435.
- Metcalf, J., Moss, E., & boyd, d. (2019). "Owning Ethics: Corporate Logics, Silicon Valley, and the Institutionalization of Ethics." *Social Research: An International Quarterly*, 86(2), 449-476.
- Selbst, A. D., Boyd, D., Friedler, S. A., Venkatasubramanian, S., & Vertesi, J. (2019). "Fairness and Abstraction in Sociotechnical Systems." *ACM Conference on Fairness, Accountability, and Transparency (FAT)**.
- Kroll, J. A. (2021). "Outlining Traceability: A Principle for Operationalizing Accountability in Computing Systems." *ACM Conference on Fairness, Accountability, and Transparency (FAccT)*.

Connection to Program Learning Outcomes

PLO	Alignment	Contribution
PLO-3: Policy and Governance Literacy	**Primary**	This is the program's signature governance course. Students develop advanced competency in AI governance frameworks, conduct professional-grade impact assessments, and design comprehensive governance programs that integrate technical, legal, and organizational dimensions.
PLO-8: Appraise Emerging Technologies	**Secondary**	Students develop structured approaches to evaluating AI systems for their transformative potential, risks, and societal implications — applying technology assessment frameworks to real deployed systems and emerging AI capabilities.

PLO	Alignment	Contribution
PLO-4: Strategic and Organizational Thinking	**Secondary**	The AI governance program design requires students to think organizationally about roles, processes, incentives, and implementation challenges, connecting governance to business strategy and organizational culture.

Course Policies

- **Seminar Preparation**: Students are expected to complete all assigned readings before each seminar and come prepared to contribute substantively to discussion.
- **Portfolio Artifacts**: The algorithmic impact assessment and AI governance program are designated portfolio artifacts. Students will revise these based on faculty feedback for inclusion in their program portfolio.
- **Team Formation**: Teams of 3-4 for the governance program design will be formed in Week 11 based on sector interest and complementary skills.
- **AI Tool Use**: Students may use AI tools for research and drafting but must demonstrate original analytical reasoning. All AI-assisted content must be disclosed and critically evaluated.
- **Late Work**: Weekly briefings are not accepted late. Major assignments lose 5% per day late up to 5 days; after 5 days, assignments receive no credit.
- **Academic Integrity**: Governance artifacts must represent original analysis. Frameworks and sources must be properly attributed.
- **Guest Practitioners**: Several sessions will feature guest practitioners from industry, government, and civil society organizations working in AI governance.

TSI 340 — Technology Strategy and Business Models

Catalog Description

Advanced course in technology strategy examining how firms create and capture value through technology. Students analyze platform strategy, ecosystem dynamics, digital transformation, technology adoption and diffusion, standards competition, and strategy formulation under deep uncertainty. The course employs the case method extensively, drawing on cases from Harvard Business School, Kellogg, and Stanford, supplemented by strategy workshops where students apply frameworks to live strategic challenges. Industry mentors participate in selected sessions and provide feedback on the final strategy project, in which student teams develop a comprehensive technology strategy for a real organization.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 240 (Innovation and Entrepreneurship)
Semester	Year 3, Spring
Format	Two 75-minute sessions per week (case discussion + strategy workshop)
Contact Hours	150 minutes/week (37.5 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Analyze** technology companies' competitive strategies using frameworks for platforms, ecosystems, and dynamic capabilities, identifying sources of advantage and vulnerability (Analyze)
2. **Evaluate** digital transformation initiatives for strategic coherence, organizational readiness, and risk, distinguishing between transformative and performative efforts (Evaluate)
3. **Formulate** a technology strategy that aligns technical architecture decisions with business model choices and competitive positioning (Create)
4. **Assess** make/buy/partner decisions using transaction cost economics, resource-based reasoning, and ecosystem considerations (Evaluate)
5. **Present** strategic recommendations persuasively to a simulated executive audience, demonstrating command of evidence, frameworks, and professional communication (Create/Apply)

Weekly Topic Outline

Week	Topic	Activities
1	What is technology strategy? Foundations and frameworks	Workshop: Mapping the strategic landscape of a tech sector
2	Platform strategy: architecture, governance, and network effects	Case discussion: Platform design decisions and their strategic consequences
3	Ecosystem strategy: complementors, orchestration, and value co-creation	Workshop: Ecosystem mapping exercise — identifying complementors and bottlenecks
4	Case: Apple's ecosystem strategy	Deep case analysis: how architecture, governance, and ecosystem management interact
5	Digital transformation: frameworks, maturity models, and common failures	Workshop: Assessing digital transformation readiness for a real organization
6	Case: A digital transformation failure — post-mortem analysis	Case analysis: identifying root causes, organizational dynamics, and lessons learned
7	**Midterm: case-based strategic analysis**	Timed case analysis with written strategic recommendations
8	Technology adoption and diffusion: tipping points and standards wars	Workshop: Modeling adoption dynamics; predicting tipping points
9	Case: Browser wars / streaming wars	Case analysis: standards competition, winner-take-all dynamics, and strategic moves
10	AI strategy: build vs. buy, horizontal vs. vertical, AI-native business models	Workshop: Developing an AI strategy for an established firm vs. a startup
11	Dynamic capabilities and strategic pivots	Case discussion: successful and unsuccessful pivots; sensing, seizing, transforming
12	Technology M&A: acquisition strategy, integration, and valuation	Workshop: M&A target evaluation and integration planning exercise
13	Strategy under deep uncertainty: scenario planning and real options	Workshop: Real options analysis applied to technology investment decisions
14	Final strategy project working sessions with industry mentor feedback	Team workshops with assigned industry mentors; project refinement
15	**Final strategy presentations to panel with industry judges**	Team presentations with Q&A from faculty and industry panelists

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Case participation (x8)	15%	Active, prepared contribution to case discussions assessed on analytical quality, use of frameworks, and engagement with peers' arguments	PLO-4, PLO-1
Case write-ups (x3)	15%	Individual 1000-word written case analyses applying course frameworks to assigned cases; assessed on analytical rigor, strategic insight, and writing quality	PLO-4, PLO-6
Midterm case exam	15%	Timed individual case analysis requiring application of course frameworks to a novel strategic situation; assesses analytical speed and framework fluency	PLO-4, PLO-1
Technology strategy project (team)	35%	Team portfolio artifact: comprehensive technology strategy for a real organization, including competitive analysis, strategic options evaluation, recommended strategy, implementation roadmap, and risk assessment. Developed with industry mentor guidance.	PLO-4, PLO-1, PLO-6
Final presentation to industry panel	15%	Team presentation of strategy recommendations to a panel of faculty and industry judges; assessed on strategic reasoning, evidence quality, and persuasive communication	PLO-4, PLO-6
Peer evaluation	5%	Structured evaluation of team members' contributions to the strategy project	PLO-4

Required Readings

- Cusumano, M. A., Gawer, A., & Yoffie, D. B. (2019). *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power*. Harper Business.
- Burgelman, R. A., Christensen, C. M., & Wheelwright, S. C. (2020). *Strategic Management of Technology and Innovation*. 5th edition. McGraw-Hill. Selected chapters as assigned.
- HBS/Kellogg/Stanford case pack (purchased through course pack system). Approximately 10 cases assigned throughout the semester.

Recommended Readings

- Iansiti, M. & Lakhani, K. R. (2020). *Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World*. Harvard Business Review Press.

- Adner, R. (2012). *The Wide Lens: What Successful Innovators See That Others Miss*. Portfolio/Penguin.
- Osterwalder, A. & Pigneur, Y. (2010). *Business Model Generation*. John Wiley & Sons.
- Teece, D. J. (2018). "Profiting from Innovation in the Digital Economy." *Research Policy*, 47(8), 1367-1387.

Connection to Program Learning Outcomes

PLO	Alignment	Contribution
PLO-4: Strategic and Organizational Thinking	**Primary**	The course is built around strategic analysis and formulation. Students develop fluency with strategy frameworks, practice applying them to complex technology contexts, and produce a comprehensive strategy document for a real organization.
PLO-1: Sociotechnical Systems Thinking	**Secondary**	Technology strategy inherently requires understanding how technical systems interact with markets, organizations, and users. Students analyze how platform architectures shape competitive dynamics and how digital transformation involves sociotechnical change.
PLO-6: Communication and Translation	**Secondary**	Case discussions and the final presentation develop students' ability to communicate strategic reasoning persuasively to executive audiences, translating between technical possibilities and business implications.

Course Policies

- **Case Preparation**: Students must read and prepare assigned cases before each discussion session. Cold calling is used to ensure preparation. Two unexcused absences from case discussions result in a zero for case participation.
- **Case Write-Up Format**: 1000-word maximum, strictly enforced. Write-ups must state the key strategic issue, analyze using course frameworks, and recommend a specific course of action with justification.
- **Industry Mentors**: Each team is paired with an industry mentor who provides guidance on the strategy project. Teams are expected to meet with their mentor at least three times during the semester.
- **Portfolio Artifact**: The technology strategy project is a designated portfolio artifact. Teams will receive detailed feedback for revision and individual portfolio inclusion.

- **AI Tool Use**: AI tools may be used for research and data analysis. Strategic analysis and recommendations must reflect the student's own reasoning. Case write-ups completed primarily by AI tools will receive no credit.
- **Late Work**: Case write-ups are not accepted late. Strategy project milestones lose 10% per day late.
- **Academic Integrity**: Case discussions and write-ups must reflect the student's own analysis. Sharing case write-ups or strategy project materials between teams is prohibited.

TSI 350 — Applied Leadership Practicum

Catalog Description

Applied leadership development through a semester-long consulting engagement with a real nonprofit, startup, or community organization facing a technology challenge. Students work in teams of four to five, rotating through the team lead role across project phases. Where TSI 250 focuses on leadership theory and self-awareness, this course develops applied leadership capabilities: consulting skills, leading through influence, managing cross-cultural teams, navigating stakeholder conflict, and presenting to non-expert audiences. A professional leadership coach provides individual and team coaching sessions throughout the semester.

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 250
Semester	Year 3, Spring
Format	One 75-minute seminar + one 2-hour practicum per week
Contact Hours	195 minutes/week (48.75 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Lead** a cross-functional team through a real client engagement, rotating through leader and contributor roles *(Apply/Create)*
2. **Manage** client relationships including expectation setting, scope changes, and difficult conversations *(Apply)*
3. **Evaluate** team dynamics and intervene constructively when teams encounter conflict or dysfunction *(Evaluate)*
4. **Design** and deliver a professional client presentation and engagement deliverable *(Create)*
5. **Assess** personal leadership growth through structured self-reflection and coaching feedback *(Evaluate)*

Weekly Topic Outline

Week	Topic	Key Activities
1	From leadership theory to leadership practice: course overview	Meet client organizations; team formation; establish team charters and norms
2	Consulting fundamentals: scoping, contracting, and client management	Workshop: write a project scope document; practice expectation-setting conversations
3	Stakeholder analysis and leading through influence	Stakeholder mapping for client engagement; influence strategy development
4	Phase 1 launch: discovery and diagnosis	Teams begin client discovery work; first team lead rotation begins
5	Active listening, powerful questions, and client interviewing	Practicum: client interviews and site visits; seminar: debrief and coaching
6	Team dynamics: recognizing and addressing dysfunction (Lencioni)	Team health assessment; coaching session with leadership coach
7	**Mid-engagement check-in: progress presentations to clients**	Teams present discovery findings to clients; receive feedback; adjust scope if needed
8	Managing scope changes and difficult conversations	Role-play: renegotiating scope with a demanding client; second team lead rotation
9	Cross-cultural and cross-disciplinary collaboration	Workshop: navigating different communication styles and professional cultures
10	Project recovery: when things go off track	Case: recovering a failing project; teams apply recovery frameworks to their engagements
11	Giving and receiving feedback: radical candor in practice	Structured feedback exchange within teams; individual coaching sessions
12	Presenting to non-expert audiences: the client deliverable	Workshop: structure and rehearse final client presentations; peer feedback
13	Coaching and mentoring peers: developing others	Peer coaching exercise; third team lead rotation; near-final deliverable development
14	Final client presentations	Teams deliver final presentations and deliverables to client organizations
15	Personal leadership brand and synthesis	Leadership brand workshop; final reflective essay; coaching debrief; course celebration

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Team charter and scope document	10%	Collaborative team charter establishing norms, roles, and rotation schedule; client scope document	PLO-7
Leadership rotation reflections (x3)	15%	Three reflective essays (500-700 words each) written after each team lead rotation, analyzing leadership decisions and growth	PLO-7, PLO-6
Mid-engagement client presentation	15%	Team presentation of discovery findings and proposed direction to client organization	PLO-6, PLO-7
Coaching engagement log	10%	Documented record of coaching sessions with goals, insights, and action items	PLO-7
Final client deliverable	25%	Professional deliverable (report, prototype, strategy document) produced for the client organization	PLO-7, PLO-4, PLO-6
Final client presentation	15%	Polished team presentation of engagement outcomes and recommendations to client	PLO-6, PLO-7
Final reflective essay (portfolio artifact)	10%	Individual essay (1,500-2,000 words) assessing personal leadership growth across the semester with evidence from coaching, peer feedback, and rotation experiences	PLO-7

Grading Scale: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (<60)

Required Readings

- Lencioni, P. (2002). *The Five Dysfunctions of a Team: A Leadership Fable*. Jossey-Bass.
- Block, P. (2023). *Flawless Consulting: A Guide to Getting Your Expertise Used* (4th Edition). Wiley.
- Ibarra, H. (2015). *Act Like a Leader, Think Like a Leader*. Harvard Business Review Press.

Recommended Readings

- Scott, K. (2019). *Radical Candor: Be a Kick-Ass Boss Without Losing Your Humanity* (Revised Edition). St. Martin's Press.

- Schein, E. H. (2013). *Humble Inquiry: The Gentle Art of Asking Instead of Telling*. Berrett-Koehler Publishers.
- Heifetz, R. A., Grashow, A., & Linsky, M. (2009). *The Practice of Adaptive Leadership: Tools and Tactics for Changing Your Organization and the World*. Harvard Business Press.
- Edmondson, A. C. (2019). *The Fearless Organization: Creating Psychological Safety in the Workplace for Learning, Innovation, and Growth*. Wiley.

Connection to Program-Level Learning Outcomes

PLO	Alignment
PLO-7: Lead Cross-Functional Teams (Primary)	Students lead real teams through a real engagement with rotating leadership roles, coaching support, and structured reflection. This is the most intensive applied leadership experience in the core curriculum, bridging TSI 250 theory to capstone-ready practice.
PLO-6: Communicate Complex Technical Concepts (Secondary)	Students present to non-expert client audiences, manage client communications, and deliver professional engagement deliverables — all requiring translation of technical concepts for diverse stakeholders.
PLO-4: Formulate and Execute Innovation Strategies (Secondary)	The consulting engagement requires students to diagnose technology challenges, develop strategic recommendations, and deliver actionable plans — applying innovation and strategy skills in a real organizational context.

Course Policies

- **Attendance:** Students are expected to attend all sessions. More than two unexcused absences may result in a reduced grade, given the practicum nature of the course and obligations to client partners.
- **Late Work:** Assignments submitted late without prior arrangement will be penalized 5% per day, up to a maximum of 25%. Client deliverables have firm deadlines that cannot be extended.
- **Academic Integrity:** All work must be original. Proper citation is required for all sources. Use of generative AI tools must be disclosed and is permitted only for brainstorming, not for producing submitted text or client deliverables.
- **Client Confidentiality:** Students must treat all client information as confidential. A non-disclosure agreement may be required depending on the client organization.
- **Professional Conduct:** Students represent the university in their client interactions and are expected to maintain professional standards of communication, punctuality, and follow-through.
- **Accessibility:** Students requiring accommodations should contact the instructor and the Office of Disability Services within the first two weeks of the semester.

TSI 410 — Technology Futures and Foresight

Catalog Description

Capstone-level course in foresight and futures thinking for technology leaders. Students learn and apply systematic methods for anticipating technological change and its societal implications, including horizon scanning, scenario planning, Three Horizons Framework, technology roadmapping, Wardley Mapping, backcasting, and causal layered analysis. The course develops futures literacy — the capacity to think rigorously about uncertainty, possibility, and long-term consequence — as an essential competency for responsible technology leadership. Students produce a comprehensive foresight report on an emerging technology domain, integrating multiple methodologies and demonstrating the ability to synthesize technical, social, economic, and political signals into actionable strategic insight

Course Information

Field	Detail
Credits	3
Prerequisites	TSI 310 (Complex Adaptive Systems)
Semester	Year 4, Fall
Format	Two 75-minute sessions per week (seminar + foresight workshop)
Contact Hours	150 minutes/week (37.5 hours/semester)

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Apply** at least four structured foresight methodologies — including scenario planning, horizon scanning, Three Horizons Framework, technology roadmapping, Wardley Mapping, backcasting, and causal layered analysis — to emerging technology domains (Apply)
2. **Evaluate** emerging technologies for transformative potential, development timeline, and societal implications, distinguishing between hype and substantive signal (Evaluate)
3. **Synthesize** technical, social, economic, and political signals into coherent, internally consistent future scenarios that illuminate strategic choices (Create)
4. **Design** a technology roadmap or strategic foresight brief that translates futures analysis into actionable recommendations for decision-makers (Create)
5. **Critique** predictions and forecasts for underlying assumptions, cognitive biases, and methodological rigor, applying calibration and epistemic humility (Evaluate)

Weekly Topic Outline

Week	Topic	Activities
1	Futures literacy: why we study futures (and what foresight is not)	Seminar: Distinguishing prediction from foresight; history of futures studies
2	Horizon scanning: STEEP analysis, weak signals, and wild cards	Workshop: Conducting a STEEP scan on a current technology domain; signal identification
3	Scenario planning I: methodology and the 2x2 matrix approach	Workshop: Building a scenario framework — identifying critical uncertainties and driving forces
4	Scenario planning II: narrative development and stress-testing	Workshop: Writing scenario narratives; wind-tunneling strategies against scenarios
5	Three Horizons Framework and Wardley Mapping	Workshop: Map an emerging technology domain using Three Horizons; construct a Wardley Map of its value chain and evolution
6	Technology assessment: constructive TA, real-time TA, and participatory TA	Seminar: Comparative analysis of TA traditions; designing a participatory assessment
7	**In-class scenario planning exercise on a live emerging technology**	Full-session workshop: teams conduct rapid scenario planning on an assigned emerging tech
8	Technology roadmapping: product, science-based, and industry approaches	Workshop: Building a technology roadmap for an emerging domain
9	Backcasting: designing pathways from preferred futures	Workshop: Starting from a desirable 2040 scenario and working backward to identify milestones
10	Causal layered analysis: litany, systems, worldview, and myth	Workshop: Applying CLA to a contemporary technology controversy; uncovering deep assumptions
11	Foresight in practice: corporate, government, and non-profit applications	Seminar: Guest practitioners from corporate strategy, government foresight, and civil society
12	Emerging tech deep dives: student-led seminars	Student presentations on quantum computing, synthetic biology, space technology, climate tech, and neurotechnology

Week	Topic	Activities
13	Foresight report peer review workshop	Workshop: Structured peer review of draft foresight reports; feedback and revision planning
14	**Final foresight report presentations**	Student presentations of comprehensive foresight reports to faculty and guest evaluators
15	Reflection: becoming a lifelong futures thinker	Seminar: Integration of methods; personal foresight practice; futures journal review

Assessment Methods

Assessment	Weight	Description	PLO Mapping
Horizon scanning brief	10%	Individual brief (1500 words) identifying and analyzing weak signals, emerging trends, and wild cards in an assigned technology domain using STEEP analysis	PLO-8, PLO-1
Scenario planning exercise report	15%	Team report (2500 words) documenting the in-class scenario planning exercise, including driving forces analysis, scenario narratives, and strategic implications	PLO-8, PLO-1
Student-led seminar	10%	Individual or pair presentation (25 minutes + discussion) providing a foresight-oriented analysis of an emerging technology, assessed on methodological rigor, analytical depth, and facilitation quality	PLO-8, PLO-1
Foresight report	35%	Comprehensive individual portfolio artifact (5000 words + appendices): a full foresight analysis of an emerging technology domain integrating at least three methodologies, including horizon scan, scenario set, technology roadmap or strategic brief, and governance/policy implications	PLO-8, PLO-1, PLO-3
Final presentation	15%	Individual presentation of foresight report findings and recommendations to faculty and guest evaluators, with Q&A defense of methodology and conclusions	PLO-8, PLO-6
Weekly futures journal	10%	Ongoing individual journal documenting horizon scanning observations, methodological reflections, and evolving thinking about the student's foresight report topic; submitted at Weeks 5, 10, and 15	PLO-8
Participation	5%	Active engagement in seminars, workshops, and peer review activities	PLO-8

Required Readings

- Slaughter, R. A. (2005). *The Foresight Principle: Cultural Recovery in the 21st Century*. Praeger. Selected chapters as assigned.
- Schwartz, P. (1996). *The Art of the Long View: Planning for the Future in an Uncertain World*. Currency Doubleday.
- Inayatullah, S. (2008). "Six Pillars: Futures Thinking for Transforming." *Foresight*, 10(1), 4-21.
- Tetlock, P. & Gardner, D. (2015). *Superforecasting: The Art and Science of Prediction*. Crown. Chapters 1-5.

Recommended Readings

- Webb, A. (2016). *The Signals Are Talking: Why Today's Fringe Is Tomorrow's Mainstream*. PublicAffairs.
- Jasanoff, S. & Kim, S.-H. (Eds.). (2015). *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. University of Chicago Press.
- Voros, J. (2003). "A Generic Foresight Process Framework." *Foresight*, 5(3), 10-21.
- Wilkinson, A. & Kupers, R. (2014). *The Essence of Scenarios: Learning from the Shell Experience*. Amsterdam University Press.

Connection to Program Learning Outcomes

PLO	Alignment	Contribution
PLO-8: Appraise Emerging Technologies	**Primary**	This is the primary course for PLO-8. Students systematically apply foresight methodologies to evaluate emerging technologies for their transformative potential, timeline, risks, and societal implications. The foresight report requires comprehensive technology assessment integrating technical, social, economic, and ethical dimensions.
PLO-1: Sociotechnical Systems Thinking	**Secondary**	Every foresight methodology in the course requires understanding the co-evolution of technology and society. Scenario planning, CLA, and technology assessment all demand systemic thinking about how technical, social, economic, and political forces interact over time.
PLO-3: Policy and Governance Literacy	**Secondary**	The foresight report requires students to translate futures analysis into governance and policy implications, connecting anticipatory thinking to actionable recommendations for decision-makers.

Course Policies

- **Futures Journal**: The journal is a reflective practice tool. Entries should document observations, methodological reflections, and evolving thinking — not summarize readings. Minimum 300 words per week.
- **Student-Led Seminars**: Students select emerging technology topics in Week 3 on a first-come basis. Seminars must go beyond technology description to apply at least two foresight methodologies.
- **Portfolio Artifact**: The foresight report is a designated portfolio artifact. Students will receive detailed faculty feedback for revision and portfolio inclusion.
- **AI Tool Use**: AI tools may be used for horizon scanning and research. Foresight analysis, scenario narratives, and strategic reasoning must reflect the student's own thinking. The futures journal must be entirely the student's own writing.
- **Late Work**: The futures journal is not accepted late. The foresight report loses 5% per day late up to 5 days.
- **Peer Review**: The Week 13 peer review workshop is mandatory. Students provide structured written feedback on two peers' draft reports using a provided rubric.
- **Academic Integrity**: All foresight analysis must represent original work. Sources and methods must be transparently documented.

TSI 491/492 — Senior Capstone I and II

Catalog Description

Year-long team-based capstone experience in which teams of 4-5 students address a real sociotechnical challenge posed by an industry, nonprofit, or government sponsor. The capstone requires integration of all program dimensions — sociotechnical systems thinking, technical fluency, design, policy, ethics, strategy, and communication — into a coherent project that produces a working artifact of professional quality. TSI 491 (Fall) focuses on problem definition, research, methodology design, and project planning. TSI 492 (Spring) focuses on execution, validation, iteration, and delivery of the final artifact and comprehensive portfolio. The capstone culminates in a public showcase and defense, sponsor handoff, and submission of the student's comprehensive program portfolio.

Course Information

Field	Detail
Credits	9 total (TSI 491: 3 credits; TSI 492: 6 credits)
Prerequisites	Senior standing; completion of all core courses through Year 3
Semesters	Year 4, Fall (TSI 491) + Spring (TSI 492)
Format — TSI 491	One 2-hour seminar per week + team meetings
Format — TSI 492	One 2-hour seminar per week + extensive independent team work
Contact Hours	491: 120 minutes/week (30 hours/semester); 492: 120 minutes/week seminar + ~8 hours/week team work

Learning Objectives

Upon successful completion of this two-semester sequence, students will be able to:

1. **Scope and define** a complex, ambiguous, real-world sociotechnical problem in collaboration with an industry sponsor, translating sponsor needs into actionable project requirements (Analyze/Evaluate)
2. **Integrate** technical, design, business, ethical, and policy perspectives into a coherent project approach that reflects the program's interdisciplinary foundations (Create)
3. **Execute** a semester-long project with professional project management practices, including milestone planning, risk management, stakeholder communication, and adaptive iteration (Create)

4. **Produce** a working artifact — such as a prototype, policy framework, strategy document, design system, or governance toolkit — that addresses the sponsor's challenge at a professional level of quality (Create)
5. **Defend** project decisions in a public presentation to faculty, sponsors, and peers, demonstrating command of evidence, trade-offs, and interdisciplinary reasoning (Evaluate)
6. **Reflect** on personal and professional growth through a comprehensive portfolio that documents learning across the entire program (Evaluate)

TSI 491 (Fall) — Weekly Outline

Week	Topic	Activities
1	Kickoff: meeting sponsors, forming teams	Seminar: Sponsor presentations; team formation based on interest, skills, and concentration
2	Project scoping: problem definition and stakeholder analysis	Workshop: Problem framing techniques; stakeholder mapping; defining success criteria
3	Research sprint: literature review, competitive analysis, user research	Workshop: Research methodology selection; rapid evidence synthesis
4	**Problem definition presentations (Checkpoint 1)**	Team presentations of problem definition to faculty and sponsors; feedback and refinement
5	Methodology design: selecting approaches and defining success criteria	Workshop: Matching methods to project type; defining measurable outcomes
6	Project planning: timeline, milestones, resources, and risk management	Workshop: Gantt charts, risk registers, communication plans; sponsor expectations alignment
7	Professional communication with stakeholders	Workshop: Status reporting, managing scope, delivering difficult news, executive summaries
8	**Progress Report I (Checkpoint 2)**	Team progress presentations; methodology validation; early findings
9	Deep work sprint I	Team meetings with faculty advisor; focused project execution
10	Deep work sprint II	Team meetings with faculty advisor; focused project execution

Week	Topic	Activities
11	Preliminary findings and pivot decisions	Seminar: Sharing early results; making evidence-based decisions about scope and direction
12	**Progress Report II (Checkpoint 3)**	Team progress presentations; sponsor feedback; spring planning preview
13	Fall deliverable preparation	Workshop: Structuring deliverables; documentation standards; presentation design
14	**Fall deliverable presentations**	Formal presentations of fall work to faculty, sponsors, and peers
15	Reflection and spring planning	Seminar: Fall retrospective; updated spring project plan; individual reflection

TSI 492 (Spring) — Weekly Outline

Week	Topic	Activities
1	Spring kickoff: revised scope and updated plan	Seminar: Reviewing fall feedback; finalizing spring scope and milestones
2	Execution sprint I	Team work with faculty advisor check-ins; focused artifact development
3	Execution sprint II	Team work with faculty advisor check-ins; continued development
4	**Mid-sprint review with sponsors (Checkpoint 4)**	Team presentations to sponsors; validation of direction; scope adjustments
5	Validation cycle I: testing and evaluation	Workshop: User testing, stakeholder review, technical validation methods
6	Iteration from testing: incorporating feedback	Team work: revising artifact based on validation findings
7	Execution sprint III	Team work: advancing toward final deliverable
8	**Progress report (Checkpoint 5)**	Team progress presentations; final adjustments; showcase preparation planning

Week	Topic	Activities
9	Validation cycle II: final testing and refinement	Team work: final round of validation and quality assurance
10	Portfolio compilation workshop	Workshop: Assembling the comprehensive program portfolio; selecting artifacts; writing reflections
11	Final deliverable preparation I	Team work: polishing deliverables, documentation, and presentation materials
12	Final deliverable preparation II	Team work: dress rehearsal presentations; peer feedback
13	**Public capstone showcase and defense**	Formal public event: team presentations, artifact demonstrations, and Q&A with faculty, sponsors, and invited guests
14	Sponsor delivery and handoff	Team meetings with sponsors: final deliverable handoff, documentation, and transition planning
15	Program reflection and portfolio submission	Seminar: Program retrospective; individual reflection essays; comprehensive portfolio submission

Assessment Methods (TSI 491 + 492 Combined)

Assessment	Weight	Description	PLO Mapping
Problem definition and research report	10%	Team deliverable (491): comprehensive problem definition including stakeholder analysis, literature review, competitive landscape, and user research findings	PLO-1, PLO-2, PLO-7
Project plan and methodology	5%	Team deliverable (491): detailed project plan with timeline, milestones, risk register, communication plan, and methodology justification	PLO-4
Fall deliverable and presentation	10%	Team deliverable (491): end-of-fall artifact (preliminary prototype, draft framework, initial analysis) with formal presentation	PLO-1, PLO-5, PLO-6
Progress reports and sponsor engagement	10%	Team deliverable (491+492): quality of checkpoint presentations, sponsor communication, and adaptive project management across both semesters	PLO-4, PLO-6

Assessment	Weight	Description	PLO Mapping
Final deliverable/artifact	25%	Team deliverable (492): the completed capstone artifact — assessed on quality, relevance to sponsor needs, integration of program perspectives, and professional polish	All PLOs
Public capstone defense	15%	Team presentation (492): public showcase presentation and Q&A defense, assessed on clarity, persuasiveness, command of evidence, and ability to field challenging questions	PLO-6, PLO-1
Comprehensive portfolio	15%	Individual deliverable (492): curated portfolio of work across the entire program including revised artifacts from core courses, capstone contributions, and reflective commentary demonstrating growth across all PLOs	All PLOs
Peer evaluation	5%	Individual assessment (491+492): structured evaluation of team members' contributions conducted at end of each semester; patterns of concern are investigated by faculty	PLO-4
Individual reflection essay	5%	Individual deliverable (492): 2000-word reflective essay examining personal and professional growth, integrating experiences across the program, and articulating a vision for post-graduation practice	PLO-8

Required Readings

- Schon, D. A. (1983). *The Reflective Practitioner: How Professionals Think in Action*. Basic Books. Chapters 1-3.
- Project-specific reading lists curated by faculty advisor and tailored to each team's domain, methodology, and sponsor context.

Recommended Readings

- Rittel, H. W. J. & Webber, M. M. (1973). "Dilemmas in a General Theory of Planning." *Policy Sciences*, 4(2), 155-169.
- Brown, T. & Katz, B. (2019). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*. Revised edition. Harper Business.
- Meadows, D. H. (2008). *Thinking in Systems: A Primer*. Chelsea Green Publishing.

Connection to Program Learning Outcomes

The capstone is the program's culminating integrative experience and is designed to assess all eight Program Learning Outcomes.

PLO	Alignment	Contribution
PLO-1: Sociotechnical Systems Thinking	**Assessed**	Teams must analyze the full sociotechnical context of their sponsor's challenge, understanding how technical, social, organizational, and policy dimensions interact.
PLO-2: Human-Centered Design	**Assessed**	Projects require user research, stakeholder engagement, and design processes that center the needs and experiences of affected communities.
PLO-3: Policy and Governance Literacy	**Assessed**	Teams must identify and address relevant regulatory, governance, and policy considerations in their project domain.
PLO-4: Strategic and Organizational Thinking	**Assessed**	Project planning, sponsor management, and strategic framing of deliverables require organizational thinking and professional judgment.
PLO-5: Technology Fluency	**Assessed**	Teams must demonstrate appropriate technical competency in building, evaluating, or analyzing technological systems relevant to their project.
PLO-6: Communication and Translation	**Assessed**	The capstone defense, sponsor communications, and portfolio require translating complex interdisciplinary work for diverse audiences.
PLO-7: Lead Cross-Functional Teams	**Assessed**	The year-long team project requires sustained cross-functional collaboration, adaptive leadership, facilitation, and conflict resolution in ambiguous, high-stakes contexts. Peer evaluations assess individual leadership contributions.
PLO-8: Appraise Emerging Technologies	**Assessed**	The capstone foresight component and technology assessment integrated into every project require students to evaluate the transformative potential, risks, and societal implications of the technologies they work with.

Capstone Types by Concentration

Concentration	Typical Capstone Artifacts
AI Governance	AI governance framework, algorithmic audit toolkit, policy recommendation package, or responsible AI implementation guide

Concentration	Typical Capstone Artifacts
Product and Innovation	Working prototype with product strategy, go-to-market plan, or innovation roadmap
Human-Centered Design	Design system, comprehensive research report, service blueprint, or participatory design framework
Technology Strategy	Strategic analysis and recommendation package, market entry strategy, or digital transformation plan

Course Policies

- **Team Formation**: Teams of 4-5 are formed during Week 1 of TSI 491 based on sponsor project interest, concentration mix, and complementary skills. Each team should include students from at least two concentrations.
- **Faculty Advisors**: Each team is assigned a faculty advisor who serves as primary mentor throughout the year. Teams meet with their advisor at minimum biweekly.
- **Sponsor Engagement**: Teams are expected to maintain regular communication with their sponsor organization. A minimum of one sponsor check-in per month is required; most teams meet more frequently.
- **Checkpoints**: The five formal checkpoints are mandatory milestone presentations. Missing a checkpoint without prior faculty approval results in a grade reduction for the progress reports component.
- **Portfolio**: The comprehensive portfolio is an individual deliverable even though the capstone project is team-based. Each student curates their own portfolio, selects their strongest artifacts from across the program, and writes individual reflective commentary.
- **Intellectual Property**: IP arrangements are established between the university and sponsor organization before the project begins. Students retain the right to include work in their portfolios.
- **AI Tool Use**: Teams may use AI tools as appropriate to their project. All AI use must be documented in the project methodology section and final deliverable.
- **Professional Standards**: Capstone teams are expected to conduct themselves professionally in all sponsor interactions. Faculty advisors will address concerns about professional conduct.
- **Late Work**: Checkpoint deadlines are firm. The final deliverable and portfolio deadlines are firm due to the public showcase schedule.

- **Academic Integrity**: All work must be original and properly attributed. Team members are jointly responsible for the integrity of team deliverables. Individual deliverables (reflection essay, portfolio commentary) must represent the student's own thinking.