Concentration in Technology Innovation

The Technology Innovation Concentration instills an entrepreneurial mindset in BU’s engineering students, preparing them to recognize and exploit opportunities for technical innovations that can lead to viable commercial products and profitable businesses. These students epitomize the Societal Engineer, dedicated to using creative problem-solving skills and global awareness to solve some of society’s most pressing challenges. They benefit greatly from the concentration’s focus on understanding the innovation and entrepreneurial process from start to finish.

The four-course, 16-credit concentration is open to all undergraduate engineering students. The concentration is noted on students’ official transcripts and will prepare students to work more effectively as engineers in any field and organization, and provides a launching pad for advancement into future management and leadership positions.

It is recommended that students interested in pursuing a Concentration in Technology Innovation declare their concentration as early as possible in their degree program in order to facilitate course planning, but in no case later than May 1 of a student’s junior year. Course requirements are found below, in addition to details regarding the required experience component.

Concentration requirements:

1. A sequence of four courses (16 credits) consisting of two required courses (8 credits) listed below and two courses (8 credits) chosen from the list of additional courses.

   Required courses:
   - QST SI 480 – Business of Technology Innovation - 4 cr (offered both semesters, but recommended that it be taken in junior year)
   - QST SI 482 – Strategy for Technology Based Firms - 4 cr (pre-requisite: SMG SI 480)

   Students should check availability of courses each semester; not all courses are offered every semester.

   Additional Courses: (Choose two courses – 8 credits)
   - CAS IR 593* – Grassroots Finance in Africa and the Developing World – 4 cr
   - ENG BE 428 – Device and Diagnostic Design – 4 cr
   - ENG BE 468 – Clinical Applications of Biomedical Design -- 4 cr
   - ENG EK 280 – Technology, Society and Policy – 4 cr
   - ENG EK 409 – Engineering Economy – 4 credits (no longer offered)
   - ENG ME 502** – Invention: Technology Creation, Protection, and Commercialization – 4 cr ENG
   - ME 517 – Product Development – 4 cr
   - ENG ME 525 – Technology Ventures – 4 cr (no longer offered)
   - ENG ME 506 – Engineering Device Applications - 4cr (new)
   - ENG ME 583 – Product Management – 4 cr
   - QST SI 444* – Entrepreneurship – 4 cr
   - QST SI 445* – Managing the Growing Enterprise – 4 cr
   - QST SI 448* - Dilemmas In Scaling New Ventures – 4cr
   - QST SI 451* – Organizing for Design & Innovation – 4 cr
   - QST SI 453* – Strategies for Environmental Sustainability – 4 cr
   - QST SI 464** - Intellectual Property Strategies – 4 cr (pre-requisite: SMG SI 422 or SMG SI 480)
• QST SI 471* – International Entrepreneurship – 4 cr
• QST SI 475* --Global Management Experience – 4 cr
• CAS CS 491* – BU Spark! Innovation Ventures – 4 cr
• CAS CS 299* -- San Francisco Experience – 4 cr – satisfies the experience only (overlaps with SI 480)

Notes:

* QST SI 444, 445,451, 453, 471, 475; CAS CS 299,491, and CAS IR 593 will satisfy the General Education Elective requirement only if the concentration is completed. They cannot be used to satisfy an ENG Technical/Advanced/Professional Elective. CAS IR 593 may only be used as a General Education elective, not as a Humanities or Social Science elective.

** Students cannot receive credit for both ENG ME 502 and QST SI 464

2. **Experiential Component Requirement**: Completion of a well-defined experiential component in the technology innovation area. A laboratory research, industrial internship, senior design project or directed study can satisfy this requirement. This requirement must be approved by the Concentration Coordinator and the Experiential Component Approval form must be submitted to the Undergraduate Records Office. After its completion, a report of the experiential component must also be submitted for approval (see “experiential reporting requirements,” below.) **Note: The Experiential Component requires completion of SI 480 and approval prior to doing the experience.**

**Experiential Component**

The experiential component is required for the TIC that is intended to exercise and apply learnings from TIC curriculum and is ideally performed after completing the 4-course sequence specified above. However, this is not always possible. Minimally, students must complete SI 480 to be eligible to undertake an approved experience. Options for experiences include senior design, internships, experiential courses, approved active participation in entrepreneurial events, and others by approval. Details on each follow.

**Important Dates**

• Concentration declaration
  o May 1, Junior year: (ensures that you receive TIC notifications)
  o October 1, Senior year (final deadline to declare concentration)

• Experience – senior design
  o October 15: experiential proposal due (ECE, BME)
  o Dec 15: experiential proposal due (ME)
  o April 1: draft PPT report due (to TIC Coordinator)
  o April 15: final PPT report due

• Experience – internships
  o May 1: prior to internship: experiential proposal due
  o Sept 15: draft PPT report due (to TIC Coordinator)
  o Sept 30: final PPT report due

• Other
  o Prior to event: experiential proposal due
  o Within 2 weeks of completion of event and before April 1: draft PPT report due
  o Within 4 weeks of completion of event and before April 15: final PPT report due
For International Students

International students can use CPT in approved internships for the experience under the TIC. The process for approval is:

1. Declare concentration
2. Complete SI 480
3. Identify internships opportunity
4. Write and submit experiential proposal
5. Submit to ENG Undergraduate Records
6. When approved, submit to ISSO
Experiential Component Requirements

Requirements common for all experiences
1. Submit an experiential proposal identifying what aspects of the experiential rubric will be tackled
2. For projects involving multiple TIC students, each student should enumerate what unique contribution from the rubrics will be tackled.
3. Do the background work supporting the proposed work (e.g., collecting data for customer or market needs assessment, etc.)
4. Produce the presentation (PPT) in draft form prior to the due date.
5. Produce a final presentation (PPT) based on the feedback from the draft presentation review
6. [Senior Design] Integrate the pitch into Sr. Design materials for the group effort (reports and presentation)

TISP-specific requirements
1. As of 10/1/2018 TISP will no longer count as a TIC experience. Exceptions will be made for any pre-existing TIC student with declaration on file before 10/1/2018.

Startup event-specific requirements
1. Discuss the scope and engagement of the startup event with the TIC coordinator in advance of the event
2. Submit an experiential proposal identifying what aspects of the experiential rubric are anticipated to be tackled and why the event is relevant to the TIC
3. Actively participate in the event. Sitting in the audience does not qualify.
4. Capture artifacts from the event (PPT, photos, sketches, mockups, etc.) and organize these into the draft presentation prior to the due date
5. Produce a final presentation (PPT) based on the feedback from the draft presentation review

Reporting Requirements (all)
The TIC experience reporting is comprised of a PowerPoint or equivalent presentation and oral delivery recorded as video and submitted electronically. Instructions and best practices for recording video will be found on the TIC Piazza site. Requirements for reporting:

1. Presentation deck of a minimum of 10 slides and a maximum of 20 slides
2. Presentations should not be a reiteration of a technical project, but should focus on elements selected from the rubric
3. Video recording limited to 5 minutes.
4. A draft presentation is required which will be reviewed against the rubric
5. Final presentation, including the video recording, is due based on feedback from draft review
6. The slide deck comprises the written summary of the TIC experience
Proposal Guidelines

Senior Design Proposal Guidelines
1. A word template for experiential proposals is provided
2. Statement that proposes what you plan to do: E.g., “I propose to use my senior design project as a basis for my Technology Innovation Concentration Experience.”
3. One paragraph about the senior design project concept and proposal. Tell us about the concept and why it benefits from at TIC experience addition
4. One paragraph describing how you will interact with your senior design team members, who they are, and if they support your efforts to use the project for the TIC experience.
5. Call out your unique contribution if there are multiple people using the project for the TIC experience
6. Describe what you propose to do in addition to the senior design technical project. For example:
   a. What research do you plan to do on market assessment?
   b. What research do you plan to do on customer needs assessment?
   c. What tools will you use for cost and value quantification?
7. State your deliverables including financial forecast and timeline, investor pitch slide deck, and anything else – business canvas, customer/market data, etc.
8. State how the deliverables will be integrated into the senior design team effort
9. Describe milestones:
   a. Draft TIC deck or portfolio
   b. Final TIC deck or portfolio
   c. Video recording of TIC presentation, posted to Piazza
   d. Date of senior design presentation

Internship Proposal Guidelines
1. A word template for experiential proposals is provided
2. Statement that proposes what you plan to do: E.g., “I propose to use an internship as a basis for my Technology Innovation Concentration Experience.”
3. One paragraph about the internship or work experience. Tell us about the position/role and why it can be justified as satisfying the elements espoused by TIC. Alternatively, how you will add TIC elements to the activity.
4. One paragraph describing how you will interact with your colleagues on the project or experience and if they support your efforts to use the project or position for the TIC experience.
5. Describe what you propose to do in the internship that addresses TIC components. For example:
   a. What research do you plan to do on market assessment?
   b. What research do you plan to do on customer needs assessment?
   c. What tools will you use for cost and value quantification?
6. State your deliverables, for example, financial forecast and timeline, investor pitch slide deck, business canvas, customer/market data, etc.
7. Describe milestones:
   a. Draft TIC deck or portfolio
   b. Final TIC deck or portfolio
   c. Video recording of TIC presentation, posted to Piazza

TIC Experience and Confidentiality Issues
Applies to internships, lab research experiences, startups, or any situation where the work may require participating in a nondisclosure agreement.
1. Students should, at the outset, be clear with their employers that the job experience will be used to satisfy the experiential requirement.
2. Experiences involving confidentiality agreements or IP agreements are not exempt from the TIC Experiential reporting requirements.
3. Students should plan for, and prepare reports (summary and presentation deck) to provide sufficient detail to be evaluated against the TIC experience rubric.
4. In these cases, the materials delivered to the TIC Coordinator can be ‘sanitized’ to prevent disclosure of confidential details; however, the reporting must include sufficient detail to demonstrate innovation and entrepreneurial activities undertaken during the experience.
5. Please consult the TIC Experience Rubric prior to embarking on the TIC experience.

<table>
<thead>
<tr>
<th>Customer Needs Assessment</th>
<th>To what extent does the report demonstrate the ability to...</th>
<th>To a large extent</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Rating</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>Team</td>
<td>Collaborate as member or leader of a project team.</td>
<td>A team leader inspiring a group to excel, or a cooperative member of a successful team.</td>
<td>Shows leadership potential, able to successfully drive a team, or able to contribute in a team without conflict.</td>
<td>Member of a functional team, able to work with others with some degree of collaboration. Successful but not optimized.</td>
<td>Part of a mixed team with some dysfunction due to uncoordinated interests. Unable to rally as a team member or leader.</td>
<td>Uncooperative as team member; or otherwise toxic to team goals.</td>
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<tr>
<td>Market Analysis</td>
<td>Summarize background research on market and competitor data in a concise and convincing way.</td>
<td>Demonstrates mastery of market and competitor data collection to validate product or service value.</td>
<td>Performs market analysis with own independent research, but not completely distilled.</td>
<td>Pulled data from corporate slide deck and massaged it Or relied heavily on google search</td>
<td>Made an effort to include customer or market data, but lacks reference or depth</td>
<td>No customer needs assessment provided. No market needs assessment provided.</td>
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<tr>
<td>Communication</td>
<td>Present complex technical concepts to a general audience that direct towards business focused outcomes.</td>
<td>Exhibits mature, independent thinking. Demonstrates command and authority over the material. Articulate oral and written communications.</td>
<td>Shows understanding and mastery of subject matter and demonstrates with oral and written communications.</td>
<td>Adequately presents ideas. Satisfactory in communicating subject matter.</td>
<td>Provides a coherent response. Some logic gaps or inconsistencies.</td>
<td>Unable to articulate an argument or lack of language mastery.</td>
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<tr>
<td>Societal Impact</td>
<td>Describe important societal problems and alternative approaches in the context of current technology capabilities.</td>
<td>Shows motivating evidence of clear societal impact and implications of work product on market, environment and society.</td>
<td>Same evidence provided to motivate value of engineering product and it's implications. Potential not fully realized</td>
<td>Knows that the engineering product has value and describes the work in expected terms. Little insight or data to support claims.</td>
<td>Attracts possible benefits but without any supporting evidence.</td>
<td>Focuses entirely on the technology with no aspect of its utility or impact.</td>
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<tr>
<td>Cost and Value Quantification</td>
<td>Relate engineering cost to customer value; defining value in terms of quantified financial impact vs. recurring and non-recurring engineering costs.</td>
<td>Demonstrates analysis of engineering costs in context including assumptions and risks; shows value derived from quantified assessment of impact. References cost and value sources.</td>
<td>Connected story of engineering costs and business value. Some gaps or missing timeline.</td>
<td>Provides cost and value estimates with dubious credibility or reference.</td>
<td>Cost estimates are dubious or without basis or derivation. Similar gaps in value calculations.</td>
<td>No demonstration of value in financial terms. No cost estimates.</td>
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<tr>
<td>Financial Forecast</td>
<td>Show a revenue and cost forecast over 5 years for the product or concept proposed.</td>
<td>Shows revenue and cost business case over timeline of at least 5 years (graphs), hardy stick.</td>
<td>Strong story, but lacks convincing data. Borderline funding of concept. Try harder</td>
<td>Shows graphic with revenue and income, but no hardy stick</td>
<td>Missing one of cost or revenue projection.</td>
<td>No timeline or financial information presented</td>
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<td>Investment Decision</td>
<td>Identify a unique and sustainable business case or model, worthy of investment with real dollars.</td>
<td>Demonstrates a novel idea with quantified impact, *must have! *</td>
<td>A strong idea with reasonable evidence to support funding. Weak in one or more aspects of a complete pitch.</td>
<td>Reasonable idea but lacks convincing evidence or impact. Ok, but not compelling</td>
<td>Makes arguments for business case and costs, but impact is marginal/ not worth funding</td>
<td>Not convincing/would not fund</td>
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