**Institute for Sustainable Infrastructure**

# ENVISION CURRICULUM MATRIX

The matrix below provides guidance for introducing the topic of sustainability and application of the Envision framework into higher education curriculum. These options are scalable to cover any setting from one lecture to one course. They are also flexible to support existing curriculum and programs such as capstone projects, engineering orientations, independent studies and other coursework. Presented options may also cover field and laboratory works as well as extracurricular activities. Educators may use traditional in-person, remote, on-line, or hybrid formats to deliver each component. The domain of sustainability, and hence the reach of presented options is broader than engineering and covers topics such as, economics, environment, architecture, construction, social sciences, and many more.

This matrix was developed by the ISI Academic Committee. For questions regarding its use or further resource development, please contact Lindsey Geiger (geiger@sustainableinfrastructure.org).

## Sustainability in Higher Education: Concepts and Content

| Contents | Lecture: One or two lectures within a more extensive course | Module: Three to four lectures | Course: Whole dedicated course, 10 Quarter or 16-Semester weeks | Custom Event or course: Workshop or Special Coursework between half-day to half-term | Bloom's Taxonomy Cognitive and Affective Domains |
|---|---|---|---|---|---|
| **Delivery and assessment** | Guest lectures and webinars with optional quiz or survey | "Lecture" contents plus Graded assignments and assessments | "Module" contents plus optional term projects | "Course" contents plus optional collaboration with professional organizations | Level of Achievements |
| **Undergraduate freshman-sophomore (foundation and fundamentals)** | Nearly 20 slides, mostly about sustainability, rating systems, and ISI Envision | • Why sustainability?<br>• What is sustainability?<br>• How to measure it<br>• Role of the engineer, ethics and professional responsibility<br>• Apply principle to a simple example project or homework assignment(s) in the course | • Why sustainability?<br>• What is sustainability?<br>• How to measure it<br>• What is the triple-bottom line?<br>• What is green design?<br>• Context-sensitive solution in design<br>• Role of the engineer, ethics and professional responsibility<br>• Development/infrastructure examples<br>• Information about general rating priority areas<br>• One or two guest speakers | • Event Example A<br>  o What is sustainability?<br>  o Speaker forum or roundtable | • Cognitive<br>  o Remember<br>  o Comprehend<br>• Affective<br>  o Receive |

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|---|---|---|---|---|---|
| **Undergraduate junior-senior (technical and professional)** | "Freshman-Sophomore" contents plus professional responsibility | "Freshman-Sophomore" contents plus<br>• Apply rating system(s) to a complex example project or homework assignment(s) within the course or to a capstone project | "Freshman-Sophomore" contents plus details on<br>• What is sustainability?<br>  o Design and construct<br>  o Operate and maintain<br>  o Decommission and recycle<br>• What is the triple bottom line?<br>  o Environment<br>  o Society<br>  o Economy<br>  o Beyond the project - Is the system financially and environmentally sustainable?<br>• What is green design, context-sensitive solution or sustainable development?<br>  o Construction material & delivery<br>  o Society & policy<br>  o Energy & carbon sequestration<br>  o Water resources, climate & infrastructure<br>  o Life cycle analysis<br>  o Efficient & intelligent transportation networks<br>  o Green building & infrastructure<br>  o Emissions & material management<br>• Examples of laws and regulations and analyze effectiveness<br>• Rating systems<br>  o Envision<br>  o LEED (USGBC)<br>  o STARS<br>  o Greenroads<br>  o CEEQUAL<br>  o BREEAM<br>  o CASBEE<br>  o CEEQUAL<br>  o GB Tool | "Freshman-Sophomore" contents plus<br>• Event Example B<br>  o Series of guest speakers and examples of sustainability and use of rating systems<br>• Capstone Example:<br>  o Basic information about sustainability<br>  o Basic information about rating systems (optional)<br>  o Use one or more rating systems to assess alternatives in a Capstone project (with or without lecture information – could let the students learn it and apply it on their own) | • Cognitive<br>  o Remember<br>  o Comprehend<br>  o Apply<br>• Affective<br>  o Receive<br>  o Respond |

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|---|---|---|---|---|---|
| **Undergraduate junior-senior (technical and professional), continued** | | | o Green Globes<br>o LEED<br>o RMI<br>o INVEST<br>o I-LAST<br>o BE2ST –in-Highways<br>o One Planet Living<br>o Green Light New York<br>o Others<br>• Two or three guest lectures on case studies<br>• What rating systems are used in your area (university, DOT or others)?<br>• Apply one to three rating systems to a real world projects | | |
| **Graduate-mentored experience (professional and technical)** | "Undergraduate" contents plus case studies on projects | "Undergraduate" contents plus<br>• Analyze several rating system(s), interview owner, select the most appropriate one and apply it to a complex (local) example project (homework assignment)<br>• Report to project owner on results | "Undergraduate" contents plus<br>• What rating systems are used in your area (university, DOT, others)? Why? Interview user?<br>• Work with Contractor, Engineer/Architect to apply rating system to a real world project<br>• Or, work with a professional organization, such as ASCE, APWA, ACEC, ICC, ASTM, ACI, AISC, and others on policies, standards or specifications | "Undergraduate" contents plus<br>• Event Example C<br>o Research on sustainability and ISI (or other rating system) effectiveness | • Cognitive<br>o Remember<br>o Comprehend<br>o Apply<br>o Analyze<br>• Affective<br>o Receive<br>o Respond<br>o Value |
| **Self-developed (professional and technical)** | "Graduate" contents plus comparative case studies on evaluating projects; or basic or applied research | "Graduate" contents plus<br>• Evaluate several rating system(s), interview owner, select the most appropriate one and apply it to a complex (local) example project (homework assignment)<br>• Report to project owner on results | "Graduate" contents plus<br>• What rating systems are used in other countries? Synthesize their framework<br>• Or, work with an international professional organization, such as ICE and others on policies, standards or specifications | "Graduate" contents plus<br>• Event Example D<br>o Develop scholarly work on sustainability and ISI (or other rating system) effectiveness | • Cognitive<br>o Remember<br>o Comprehend<br>o Apply<br>o Analyze<br>o Synthesize<br>o Evaluate<br>• Affective<br>o Receive<br>o Respond<br>o Value<br>o Organize<br>o Characterize |