PURDUE SCHOOL OF ENGINEERING AND TECHNOLOGY 2019-2020 ACADEMIC YEAR ASSESSMENT REPORT

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Introduction

The Purdue School of Engineering and Technology, IUPUI (E&T) continues its tradition of reporting its outcomes assessment activities by academic program. The assessment activities of most programs in the school are guided by the discipline-specific accreditation requirements of ABET, Inc. (http://abet.org/, formerly the Accreditation Board for Engineering and Technology), which accredits our engineering, technology, and computing programs; of the National Association of Schools of Music (NASM, http://nasm.arts-accredit.org/), through which the department of Music and Arts Technology is accredited, and the American Music Therapy Association (AMTA, https://www.musictherapy.org/), which accredits our Music Therapy programs; of the Council for Interior Design Technology (CIDA, http://www.accredit-id.org/), the accrediting body for our Interior Design Technology program; and the American Council for Construction Education (ACCE, https://www.acce-hq.org/), which accredits our Construction Management program. The Organizational Leadership and Supervision (OLS) program and Technical Communication (TCM) programs, which are not accredited at the program level, have developed their own set of learning outcomes that reflect both learning in the major and support for the desired outcomes of other programs that incorporate OLS and TCM service courses in their plans of study.

School Assessment Processes

Student Learning Outcomes for degrees and certificates in E&T are published in the Bulletin: https://bulletins.iu.edu/iupui/2019-2020/schools/purdue-enginer-tech/undergraduate/student_learning_outcomes/index.shtml. For ease of review, the outcomes of our baccalaureate programs are included in the appendix of this report.

Each undergraduate course taught in the school has one or more identified learning outcomes. These individual course outcomes are then mapped to program-level learning outcomes. Based on these defined areas of emphasis, specific courses may be targeted for assessment of a given outcome. The bulk of program assessment is administered and performed at the department level, with the school Assessment Committee providing a mechanism for sharing resources and best practices, as well as disseminating information and guidance on new campus-level assessment processes. Due to the needs of program accreditation, most assessment data is framed in the language of discipline-specific outcomes. However, the program outcomes defined by ABET, NASM/AMTA, CIDA, and ACCE to describe the knowledge, skills, and habits of mind expected of successful graduates of these programs cover the same broad areas as IUPUI's Profiles of Learning for Undergraduate Success, just with more specificity appropriate to the needs of each discipline. Thus, by focusing on attainment of discipline-specific outcomes, programs are assured of meeting the more broadly-defined Profiles. To make these linkages explicit, mappings between discipline-specific outcomes and the Profiles have been established for each program. An example of such a mapping (for the ABET Engineering outcomes) is shown in the table on the next page.

Prompted by the establishment of Principles of Graduate Learning at IUPUI, graduate programs in the School of Engineering and Technology have likewise established student learning outcomes, published in the Bulletin: https://bulletins.iu.edu/iupui/2019-2020/schools/purdue-enginer-tech/graduate/student_learning_outcomes/index.shtml. Due to the highly specialized, integrative nature of graduate programs, assessment of these outcomes focuses primarily on the thesis (or final project) rather than on individual courses.

IUPUI Profiles of Learning for Undergraduate Success	Communicator				Problem Solver				Innovator				Community Contributor			
	Evaluates Information	Listens Actively	Builds Relationships	Conveys Ideas Effectively	Thinks Critically	Collaborates	Analyzes, Synthesizes, Evaluates	Perseveres	Investigates	Creates/ Designs	Confronts Challenges	Makes Decisions	Builds Community	Respectfully Engages Own and Other Cultures	Behaves Ethically	Anticipates Consequences
ABET Outcomes (ENGINEERING):																
1 Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	X				X		X	X	X							
2 Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	X				X	X	X	X	X	X	X	X		X	X	X
3 Communicate effectively with a range of audiences	X	X	X	X	X	X	X						X	X	X	X
4 Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	X				X	X	X		X		X	X	X	X	X	X
5 Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	X	X	X	X	X	X	X	X			X	X	X	X	X	X
6 Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	X			X	X		X	X	X	X		X			X	X
7 Acquire and apply new knowledge as needed, using appropriate learning strategies	X	X			X		X	X	X							

Table 1: Map of ABET program-level learning outcomes to IUPUI Profiles. For easier readability, the individual components (in order) of each of the four Profiles categories are: COMMUNICATOR (Evaluates Information; Listens Actively; Builds Relationships; Conveys Ideas Effectively) – PROBLEM SOLVER (Thinks Critically; Collaborates; Analyzes/Synthesizes/Evaluates; Perseveres) – INNOVATOR (Investigates; Creates/Designs; Confronts Challenges; Makes Decisions) – COMMUNITY CONTRIBUTOR (Builds Community; Respectfully Engages Own and Other Cultures; Behaves Ethically; Anticipates Consequences).

School Assessment Milestones

Due to changes in curriculum that strengthen the Construction Management aspects of the program and decrease the emphasis on engineering technology, and at the recommendation of its Industrial Advisory Board, the former ABET-accredited Construction Engineering Management Technology program is now accredited American Council for Construction Education (ACCE) following a successful accreditation visit in early 2019. Consistent with the shift of program focus, the program has also updated its name from Construction Engineering Management Technology to Construction Management.

The other ABET-accredited Technology programs (Electrical and Computer Engineering Technology, Mechanical Engineering Technology, Healthcare Engineering Technology Management) underwent a successful reaccreditation visit in Fall 2019, culminating in reaffirmation of program accreditation until the next general review in 2025-26. Highlights of the assessment findings and program improvements from these self-studies are included in this report.

Following the guidance of the campus Undergraduate Affairs Committee (UAC), undergraduate programs in E&T have mapped the IUPUI Profiles of Learning for Undergraduate Success to their capstone courses, and have also identified and mapped the Profiles to a cornerstone course (key sophomore- or junior-level course). A pilot project overseen by the Institute for Engaged Learning to assess the Profiles in a sample of these capstone courses is on-track for Spring 2021.

Departmental and Program Annual Reports for 2019-2020

The 2019-2020 departmental and program assessment reports included in this school report represent the collected works of the following programs, which had significant assessment-related activities in the run-up to their accreditation visits this year:

- Electrical and Computer Engineering Technology (ECET)
- Healthcare Engineering Technology Management (HETM)
- Mechanical Engineering Technology (MET)

The table below outlines reporting for the school over the last several years. Previous years' reports are available at https://planning.iupui.edu/assessment/prac-files/school-reports/prac-school-reports.html.

Programs		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2019-20
BME		x	x	x	x	x	x	
EE/CE			x			x		
ME/EEN			x	x				
MSTE			x					
CIT			x	x				
CGT			x	x				
INTR		x	x			x		
TCM		x			x			
OLS		x			x			
ECET		x	x			x		x
MET		x	x					x
HETM		x	x			x		x
CEMT		x	x				x	
MAT					x			
NSAAC				x				

Following the Engineering Technology findings, the report concludes with a summary of the impacts of COVID-19 measures in Spring 2020 on assessment activities in the School of Engineering and Technology.

Assessment Findings and Improvements in the ABET-Accredited Engineering Technology Programs

The Engineering Technology Commission of ABET (ETAC) defines five program-level student learning outcomes that must be satisfied to meet accreditation criteria:

1. an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;
2. an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
3. an ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;
4. an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
5. an ability to function effectively as a member as well as a leader on technical teams.

Each school program then defines one or more Performance Indicators (PIs) for each learning outcome: these are specific, observable student tasks or learning artifacts that are used to demonstrate achievement of the corresponding learning outcome. Each PI has an associated method of assessment and performance target. An illustrative example of one Performance Indicator from the Electrical Engineering Technology program's assessment plan is shown here:

Student Outcome (1) **an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly defined engineering problems;**

Outcome Champion: Cooney

Table 4.1 Outcome (1) Performance Indicator 1

Performance Indicator	Method(s) of Assessment	Where data are collected	Year(s)/Semester of Data Collection	Target for Performance
PI 1-1. Students can determine voltages and currents for ac and dc circuits.	Specific questions demonstrating knowledge and comprehension will be included on final exams: the instructors should use the same/similar questions semester-to-semester, submit any changes in question(s) to the assessment committee one month prior to the final exam. Scores on the specific questions should be reported to the assessment committee each semester.	ECET 15700, 20700	Once a year	70% of students will score 70% or better on each question.

Comparing assessment results to the performance target helps uncover areas where change may be needed, either to help students achieve desired outcomes or to refine the assessment process so the data provide a better indicator of student outcome achievement.

The summaries below describe the major findings and associated improvements for each of the four ABET-accredited Engineering Technology programs (Electrical Engineering Technology, Computer Engineering Technology, Healthcare Engineering Technology Management, Mechanical Engineering Technology), developed in preparation for their 2019 ABET accreditation visit.

Electrical Engineering Technology (EET) and Computer Engineering Technology (CpET)

Outcome	Major Findings	Proposed Improvements	Results of Prior Improvements
1 (Apply STEM tools)	Performance targets were met on 4 out of 5 PIs in the most recent data collection cycle. In some cases this represented significant improvement over previous cycles. Target was NOT met on "Determine currents and voltages in AC and DC circuits."	It was found that because the circuits PI was being measured in courses that served as electives rather than requirements for CpET students, there was not enough data to evaluate the PI effectively. Assessment of this outcome will be added to another required course for CpET students. In EET, faculty expressed concern that some students were unable to demonstrate this foundational skill in their Senior Design projects. A Senior Assessment Exam was added to the senior design class (ECET 49000) in Fall 2019 to ensure students are prepared with the skills they need for their capstone projects.	Previous findings showed that while EET and CpET students had reasonable skill with understanding and modifying computer programs, they would "freeze" when asked to write a program from scratch, with 80% requiring faculty assistance to get started. A Technical Communication (TCM) class on technical documentation was added to the curriculum in 2016 as a co-requisite to the sophomore-level programming class (ECET 20900). Subsequently, students meet the target for this PI in ECET 20900, and a key component (completing a design document before starting code) has subsequently been added to an earlier programming course (ECET 16400) where students were still struggling.
2 (Design)	Targets for all Performance Indicator met, although it was noted that data	These programs will attempt to improve communication with	

	collection in courses taught by adjuncts is spotty.	adjuncts to ensure they are collecting needed data.	
3 (Communicate)	Targets for all performance indicators met		Along with the technical documentation course mentioned above, four other TCM courses were developed as co-requisites to specific technical courses with a significant documentation and/or presentation component. These were implemented in 2016, and performance on PIs related to communication has consistently met targets since 2017.
4 (Test and analyze)	Performance targets were met for 2 out of 3 PIs. The third PI, "Students will demonstrate working hardware", includes a performance target that 100% of senior design students will demonstrate working hardware as part of their project. One student in each of the last two years of data collection (2018, 2019) was unable to demonstrate working hardware (out of 12 and 15 students total, respectively).	(See next column)	Changes were made to capstone design projects in 2018 to make them team-based and sponsored by industry or faculty members, as opposed to being proposed by students as individual projects. The effect of this change – particularly, why it may be impacting the success of some students – is not yet fully understood and will continue to be monitored closely.
5 (Teamwork)	Targets for all Performance Indicators met	Because team-based projects were recently added to Senior Design, this course will be added to the list of courses where this outcome is assessed. The results of that assessment may shed some light on why there has been a dip in individual	

		student performance in hardware troubleshooting (PI of Outcome 4) since team projects were introduced.	

Healthcare Engineering Technology Management (HETM)

Outcome	**Major Findings**	**Improvements**	**Results of Prior Improvements**
1 (Apply STEM tools)	Targets for all PIs were met based on submitted student work; however, there were several instances of students not bothering to submit an assessed assignment (which, in a small program graduating fewer than 10 students per year, can significantly impact analysis).	The program will emphasize the importance of submitting assignments used for program assessment.	(See comments following the table)
2 (Design)	Targets for all PIs were met in the aggregate when considering data over a 5-year cycle. It was noted, however, that there is wide variability in individual student performance on Senior Design projects that is strongly related to student job experience. Students typically generate their own capstone project ideas, and those already working in the field have an easier time coming up with high-quality, relevant, and impactful project ideas, and are more motivated to fully invest in the project.	The program has begun reaching out to the program's clinical partners and the Indiana Biomedical Society for project ideas and sponsorships so that all students have access to clinically-relevant projects and the resources to support them.	
3 (Communicate)	Assessment of PIs related to written communication, oral communication, and appropriate use and citation of technical literature all showed a need for improvement. In particular, it was found that instructors in upper-division courses were assuming certain report-writing skills from prior coursework and	Instructors will be more explicit in their instructions and expectations for written reports. Expectations for using and citing references will be made explicit in written assignments and rubrics.	

	thus not being explicit about expectations of structure, content, and use of references.	The program will look for opportunities to add oral presentation practice to the curriculum.	
4 (Test and analyze)	Targets for all PIs met. The program notes that the courses assessed for this outcome – including several foundational electronics courses and a senior-level course on networking for healthcare systems – provide the students with valuable hands-on and critical thinking skills.		
5 (Teamwork)	Performance targets met for all PIs, which include assessment of teamwork by faculty and mentors, and by peer mentors (teammates) using a rubric. It was noted, however, that students needed additional guidance on how to perform effective peer evaluation.	Examples of how to do effective peer teamwork evaluation will be added to the course introduction to Senior Design. To ensure students have more opportunities to practice, assess, and reflect on teamwork skills, teamwork components will be added to two additional courses (lab component of HETM 20200 and lecture component of HETM 24000). Currently, teamwork is only directly assessed in Capstone Design.	

NOTE: The HETM program lost its program director and only full-time faculty member in Spring 2019. A new full-time faculty member joined the program in Summer 2020 and used the self-study writing process and associated data analysis to understand the current state of assessment, learning, and student outcomes achievement in the HETM program. Thus, although the program has existed for several years, in many ways the 2019-20 academic year served as a fresh start for data collection, assessment, and improvement.

Mechanical Engineering Technology (MET)

Outcome	Major Findings	Improvements	Results of Prior Improvements
1 (Apply STEM tools)	Targets were met for most PIs over the last 5 years; however, understanding of concepts related to	A mathematical pretest has been added to MET 11100 to see if	A Senior Assessment Exam was implemented in the Senior Design class. Administered at the

	mechanics of materials was weaker than desired. Mathematical skill remains lower than desired (see "Results of Prior Improvements".)	additional remedial math is required.	beginning of the semester, it measures student preparedness for capstone and serves as an assessment of fundamental skills developed in the freshman through junior years. Analysis of data since its implementation indicates that more improvement in fundamental mathematical ability is still needed, despite some prior improvements.
2 (Design)	Targets were met for all PIs.		The Certified Solidworks Associate exam (CSWA) is an external certification exam that tests mechanical design using the Solidworks computer aided design software package. This exam used to be optional for students for extra credit, but was incorporated into MET 20400 as a requirement starting in Spring 2019. After making it a requirement, the average score among MET students jumped from around 55% to over 80%, a significant improvement on an important job skill.
3 (Communicate)	Students are meeting or exceeding expectations on all PIs.		Several 1-credt Technical Communication (TCM) courses were introduced in 2016 as co-requisites to MET courses with a significant written report and/or oral presentation requirement. This has resulted in a step improvement in the writing and communication skills of MET students.

4 (Test and analyze)	Targets were met for all but a single PI in a single semester – an assignment to use the tools of engineering economics to analyze and select investments. The significant outcome variation in that semester is most likely due to a change of course instructor rather than a true change in student performance.	Although learning outcomes are being attained, input from students, Industrial Advisory Board members, and faculty/staff raised concerns about weaknesses in the laboratory equipment used for some testing labs. Recent equipment purchases have addressed these concerns.	
5 (Teamwork)	Students met expectations on all PIs.		

In addition to the improvements based on direct assessment of student outcomes as noted above, the Engineering Technology programs consider feedback from students on course evaluations, student surveys, and conversations with instructors and advisors; input from the Industrial Advisory Board for each program; and annual course reflections by program faculty. Individual course assignments, lecture materials, laboratories and equipment, and other curricular components are regularly updated to help students meet learning outcomes and industry expectations for graduates.

Summary of Major Impacts of COVID-19 on Assessment Activities in E&T

Due to the COVID-19 pandemic, the School of Engineering and Technology (along with the rest of the IUPUI campus) faced a sudden shift in the middle of the Spring 2020 semester to online-only instruction and assessment. Student learning assessment activities planned for that semester ultimately fell into one of the following categories:

Activities completed as originally planned or easily shifted online

This category primarily encompassed student learning artifacts already designed to be completed independently, asynchronously, and without the use of on-campus technology; or already designed to take place online. This included weekly problem sets for courses with a lot of paper-and-pencil problem solving; written assignments such as term papers; and coursework and exams already designed to be completed online.

For most Engineering and Engineering Technology programs, activities in this category were primarily low-stakes, formative assessments not typically used as a significant component of program assessment, although they did contribute to student grades in many classes.

Activities that were significantly but successfully reworked for the online environment

Laboratory and other hands-on activities, team-based activities, and other activities normally requiring use of on-campus resources had to be significantly altered. Some examples from Biomedical Engineering:

- Several laboratory courses in the curriculum require students to perform experiments, collect their own data, and then write up a lab report analyzing the data and explaining the results. Several laboratories were altered to provide a video of the instructor or TA performing the experiment for students to view, along with data to be analyzed. The lab report write-up included a few procedural questions, but the overall focus of the reports shifted to theory, analysis, and conclusions.
- A few laboratories were re-designed so that students could perform a similar experiment at home using common household items.
- Traditionally, the two-semester Capstone Design experience culminates in a public poster presentation by each team in the course. Due to concerns over technical and bandwidth limitations for some students, this live presentation was replaced by recorded team presentations followed by a live online Q&A session. The Senior Design instructor noted that the preparation required for these presentations meant that they were clearer, better organized, and more successful at keeping to time-limits compared to the traditional live presentation. Due to its success, the recorded video presentation will continue to be incorporated in future iterations of the class and has been expanded to another senior BME course with a team presentation component.

Activities for which moving online compromised the validity of the resulting data

The most broadly negative impact on assessment activities due to the move to online instruction was the loss of in-person proctored exams. Engineering programs in particular rely on such exams to test students' mathematical problem-solving and analytical reasoning which, due to the specialized mathematical notation required to show and explain such calculations, are difficult to reproduce efficiently in an online text-based tool. Some instructors attempted to give such paper-and-pencil exams as take-home exams that could then be scanned and uploaded to Canvas. While many students completed these exams with integrity and in accordance with course and campus guidelines, all three engineering departments reported evidence of academic misconduct on at least some exams:

- Some instructors reported score increases of up to 20% on these online exams compared to the historical average of exams on the same topic. The jump in scores was well outside the typical variance range.
- At least one department later discovered that exam questions had been uploaded to Chegg (an online "homework help" site that provides rapid answers to questions in a wide array of subjects) near the beginning of an online exam, and the answer provided through that system was copied and submitted by one or more students.
- At least one other department uncovered a group of students who confessed to having collaborated with each other on an exam, despite clear instructions that no collaboration was allowed.

Exams, which students tend to take more seriously (and are more likely to participate in consistently) compared to homework, are a significant source of data on student learning outcomes in most programs' assessment plans. Programs that would normally have used Spring 2020 exam data in program assessment, but now question the validity of the data, are turning to data in previous or subsequent semesters to assess the relevant outcomes.

Activities for which no online substitute was possible

Though they accounted for a small percentage of overall data collection/assessment activities in the school, activities that could not reasonably be moved online did cause significant challenges for a couple of programs. Electrical Engineering Technology assesses critically important hands-on skills through lab practica that require demonstrating competence with specific techniques and equipment used in subsequent classes. In the online-only environment there was no way to grant students access to the equipment needed for these tests, and so those particular assessments were cancelled in the Spring semester. On the plus side, none of the students affected were in their final semester, so the program made plans to complete these assessments once students were able to return to campus.

The Music Therapy programs also faced a significant challenge with requirements to complete a minimum number of clinical hours when all clinical sites locked down due to COVID concerns. As with EET, the affected students had to delay completion of those hours until they once again had access to work with the patients of their clinical partners.

Summary

Unsurprisingly, programs with a long history of online course offerings (Computer and Information Technology, Organizational Leadership and Supervision) faced only modest disruptions in their assessment activities, while programs that rely extensively on in-person, hands-on activities to assess student learning faced significant disruptions in assessment data collection. While in some cases this led to creativity and innovation in assignments and assessment tools that could get at the same outcomes, the best assessment methods were not easily scalable to large classes, particularly in the short time frame between the move to online and the end of the semester. Fortuitously, the school's only accredited program with a planned reaccreditation visit in 2020, Interior Design Technology, had already completed data collection and analysis in support of that visit, and the next program accreditation visits are not scheduled until 2022, giving time to collect more data if needed.

APPENDIX: Student Learning Outcomes for E&T Baccalaureate Programs

ABET student outcomes for Engineering programs:

Upon completing the undergraduate degree, our students will possess:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

ABET student outcomes for Engineering Technology programs:

1. an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;
2. an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
3. an ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;
4. an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
5. an ability to function effectively as a member as well as a leader on technical teams.

ABET student outcomes for Computing programs:

1. Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

ACCE outcomes for Construction Management:

1. Create written communications appropriate to the construction discipline.
2. Create oral presentations appropriate to the construction discipline.
3. Create a construction project safety plan.
4. Create construction project cost estimates.
5. Create construction project schedules.
6. Analyze professional decisions based on ethical principles.
7. Analyze construction documents for planning and management of construction processes.
8. Analyze methods, materials, and equipment used to construct projects.
9. Apply construction management skills as a member of a multi-disciplinary team.
10. Apply electronic-based technology to manage the construction process.
11. Apply basic surveying techniques for construction layout and control.
12. Understand different methods of project delivery and the roles and responsibilities of constituencies involved in the design and construction process.
13. Understand construction risk management.
14. Understand construction accounting and cost control.
15. Understand construction quality assurance and control.
16. Understand construction project control processes.
17. Understand the legal implications of contract, common, and regulatory law to manage a construction project.
18. Understand the basic principles of sustainable construction.
19. Understand the basic principles of structural behavior.
20. Understand the basic principles of mechanical, electrical and piping systems.

CIDA outcomes for Interior Design (A.S. and B.S.):

1. Retain a global view and weigh design decisions within the parameters of ecological, socio-economic and cultural contexts.
2. Create work through informed knowledge of behavioral science and human factors.
3. Apply all aspects of the design process to creative problem solving.
4. Engage in multi-disciplinary collaborations and consensus building.
5. Be effective communicators
6. Use ethical and accepted standards of practice, be committed to professional development and the industry, and understand the value of their contribution to the built environment.
7. Apply knowledge of interiors, architecture, art and the decorative arts within a historical and cultural context.
8. Apply elements and principles of tow- and three-dimensional design.
9. Apply color principles and theories.
10. Select and specify furniture, fixtures, equipment and finish materials in interior spaces.
11. Use the principles of lighting, acoustics, thermal comfort, and indoor air quality to enhance the health, safety, welfare and performance of building occupants.
12. Retain knowledge of interior construction and building systems.
13. Use laws, codes, standards, and guidelines that impact the design of interior spaces.

AMTA competency areas for Music Therapy:

Graduates of the Music Therapy program will display competence in the following competency areas defined by the American Music Therapy Association:

1. Music Theory and History
2. Composition and Arranging Skills
3. Major Performance Medium Skills
4. Functional Music Skills
5. Conducting skills
6. Movement Skills
7. Therapeutic Applications
8. Therapeutic Principles
9. The Therapeutic Relationship
10. Foundations and Principles of Music Therapy
11. Client Assessment
12. Treatment Planning
13. Therapy Implementation
14. Therapy Evaluation
15. Documentation
16. Termination and Discharge Planning
17. Professional Role/Ethics
18. Interprofessional Collaboration
19. Supervision and Administration
20. Research Methods

NASM Competencies for Music Technology programs:

1. **Performance**. Students must acquire:
a. Technical skills requisite for artistic self-expression in at least one major performance area at a level appropriate for the particular music concentration.
b. An overview understanding of the repertory in their major performance area and the ability to perform from a cross-section of that repertory.
c. The ability to read at sight with fluency demonstrating both general musicianship and, in the major performance area, a level of skill relevant to professional standards appropriate for the particular music concentration.
d. Knowledge and skills sufficient to work as a leader and in collaboration on matters of musical interpretation. Rehearsal and conducting skills are required as appropriate to the particular music concentration.
e. Keyboard competency.
f. Growth in artistry, technical skills, collaborative competence and knowledge of repertory through regular ensemble experiences. Ensembles should be varied both in size and nature.
Normally, performance study and ensemble experience continue throughout the baccalaureate program.
2. **Musicianship Skills and Analysis**. Students must acquire:
a. An understanding of the common elements and organizational patterns of music and their interaction, the ability to employ this understanding in aural, verbal, and visual analyses, and the ability to take aural dictation.
b. Sufficient understanding of and capability with musical forms, processes, and structures to use this knowledge and skill in compositional, performance, analytical, scholarly, and pedagogical applications according to the requisites of their specializations.
c. The ability to place music in historical, cultural, and stylistic contexts.

3. **Composition/Improvisation**. Students must acquire a rudimentary capacity to create original or derivative music. It is the prerogative of each institution to develop specific requirements regarding written, electronic, or improvisatory forms and methods. These may include but are not limited to the creation of original compositions or improvisations, variations or improvisations on existing materials, experimentation with various sound sources, the imitation of musical styles, and manipulating the common elements in non-traditional ways. Institutional requirements should help students gain a basic understanding of how to work freely and cogently with musical materials in various composition-based activities, particularly those most associated with the major field.
4. **History and Repertory**. Students must acquire basic knowledge of music history and repertories through the present time, including study and experience of musical language and achievement in addition to that of the primary culture encompassing the area of specialization.
5. **Synthesis**. While synthesis is a lifetime process, by the end of undergraduate study students must be able to work on musical problems by combining, as appropriate to the issue, their capabilities in performance; aural, verbal, and visual analysis; composition/improvisation; and history and repertory.

Results. Upon completion of any specific professional undergraduate degree program:
1. Students must demonstrate achievement of professional, entry-level competence in the major area, including significant technical mastery, capability to produce work and solve professional problems independently, and a coherent set of artistic/intellectual goals that are evident in their work.
2. Students are expected to have the ability to form and defend value judgments about music, and to communicate musical ideas, concepts, and requirements to professionals and laypersons related to the practice of the major field.

Learning outcomes for the B.S. in Organizational Leadership:

Upon completion of this program, students will be able to:

1. Demonstrate and apply knowledge of
    - the process and roles of leadership.
    - leadership traits.
    - leadership behavior concepts.
    - situational approaches to leadership.
    - power and influence.
    - leading during times of uncertainty, turbulence, and change.
2. Design and conduct research, as well as analyze and interpret data in order to
    - evaluate their personal leadership effectiveness.
    - evaluate their organization's effectiveness and sustainability.
    - evaluate their organization's social and environmental impact.
3. Lead an organization, or processes and functions within it that meet or exceeds desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability.
4. Function on multi-disciplinary teams.
5. Identify, formulate, and solve organizational problems.
6. Understand professional and ethical responsibility.
7. Communicate effectively verbally and nonverbally to all size audiences.
8. Understand the impact of leadership in a global, economic, environmental and societal context.
9. Demonstrate knowledge of contemporary organizational issues.
10. Use the techniques, skills, tools and concepts necessary for effective strategic and tactical planning.

Learning outcomes for the B.S. in Technical Communication:

Students with a B.S. in Technical Communication will be able to:

1. Understand theories and principles that inform technical communication
2. Apply best practices of usability and user-centered design
3. Understand the impact of technical communication in a global workplace context
4. Understand the need for sensitivity to differences in workplace international communication
5. Clearly communicate complex technical concepts visually, orally, and in writing
6. Effectively use technology to create communication products in a variety of environments
7. Plan and manage all aspects of technical communication projects
8. Function effectively in diverse groups
9. Effectively identify, analyze, interpret, and synthesize data
10. Understand and use different style guides appropriately
11. Ethically address challenges that arise in workplace technical communication contexts
12. Metacognitively reflect on their own communication skills and abilities
13. Recognize the need to engage in life-long learning