

ASSESSMENT and EVALUATION REPORT

for

STUDENT OUTCOME11 SO11

**“AN ABILITY to USE THE TECHNIQUES, SKILLS, and
MODERN ENGINEERING TOOLS NECESSARY for
ENGINEERING PRACTICES”**

COURSES Mapped to SO11 A&E

Fall Semester

CEV345E Control & Automation in Environ Facilities
CEV427/E Environmental Modelling Principles
CEV437/E Wastewater Treatment Plant Design
CEV492/E Graduation Design Project

Spring Semester

CEV328E Water Supply & Wastewater Disposal
CEV330/E Water Treatment Plant Design
CEV492/E Graduation Design Project

SURVEYS Mapped to SO11 A&E

Senior Exit, Internship (Employers), Internship (Students), Employers

Outcome Coordinator

Assoc. Prof Ebru DULEKGURGEN(2011-cont.)

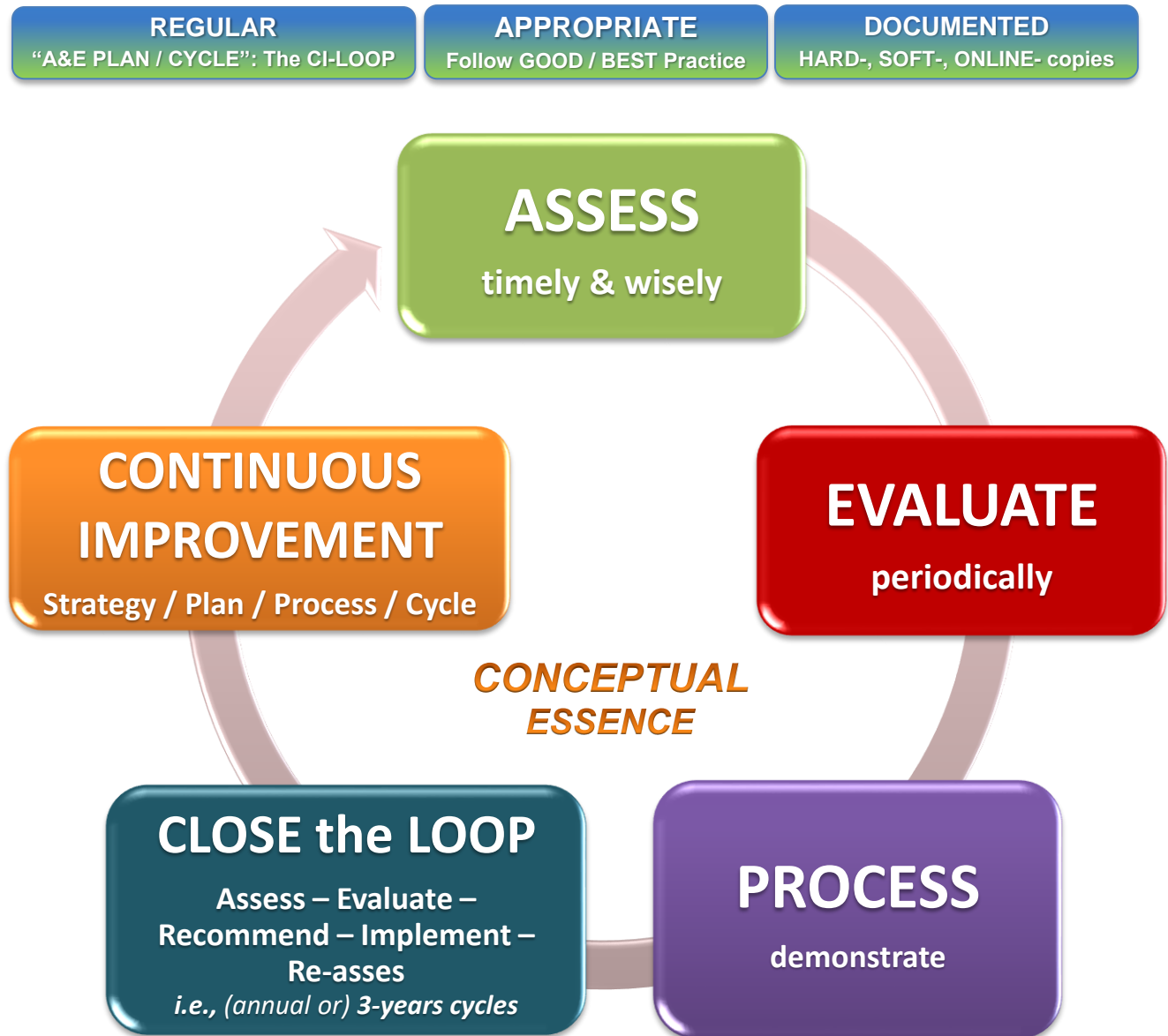
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April 2017

SYNOPSIS-1

CONCEPT / CONTENT



SYNOPSIS-2

STUDENT OUTCOME 11

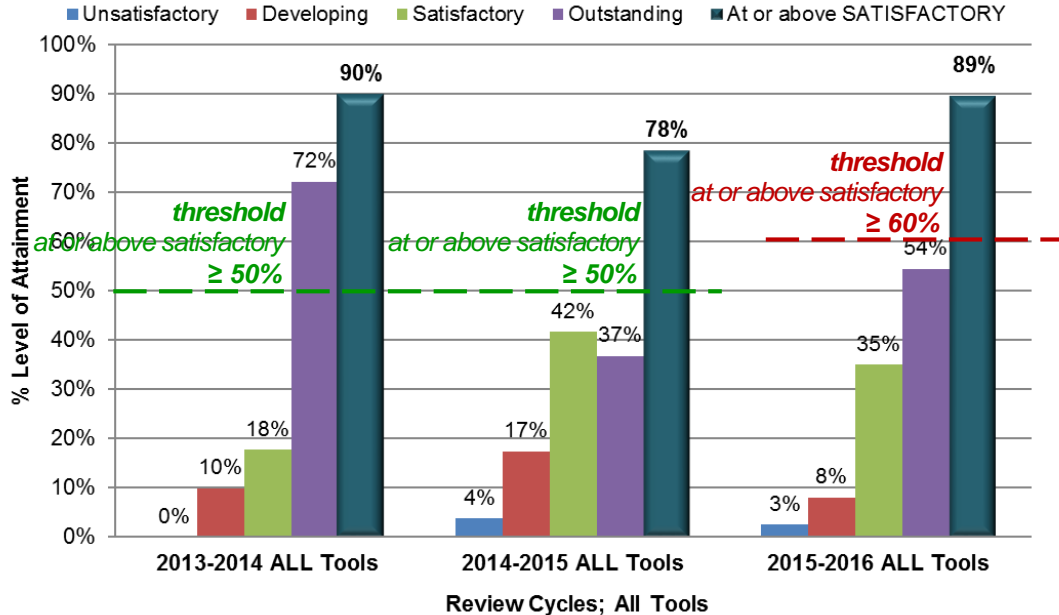
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Comparative Results of OVERALL and PI-SPECIFIC A&E Process for SO11

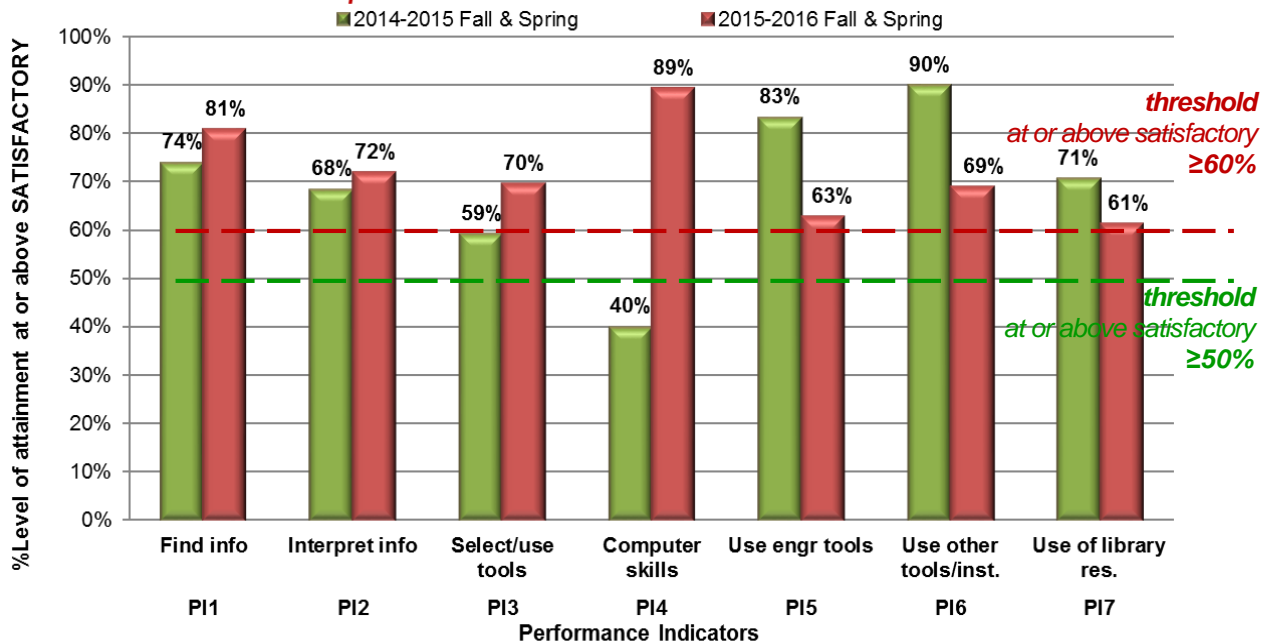
All Tools and All Data and Both Terms (Fall & Spring): 2013-2014 / 2014-2015 / 2015-2016

**A&E Results: Level of attainment of SO-11
2013-2014 , 2014-2015 , 2015-2016**

OVERALL A&E with ALL tools



**A&E Results: Level of attainment of SO-11 / 2014-2015, 2015-2016 / Courses
PI breakdown-specific level of attainment "at or above SATISFACTORY"**



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STUDENT OUTCOME 11

An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

REASONING → SO11 is the final outcome in the SO list from 1-to-11 (or a-to-k) and addresses the expected sum of genuinely built-up knowledge, skill-sets and mind-sets in senior-year students right before graduation. It has been mapped to various compulsory courses within 4-years curriculum of the ITU EEUP; all of them being junior- and senior-year courses (Table 1). Accordingly, assessment and evaluation (A&E) of SO11 has been of particular importance for summative assessment of the 4-years EEUP curriculum; the former referred as a good practice example for program assessment. Therefore, it was required to structure a timely, well-planned, documented A&E Plan for SO11 so to contribute meaningfully to the overall achievements in assessment and evaluation of the ITU EEUP.

METHODOLOGY → Assessment of SO11 was carried out for the first time in 2011-2012 Fall semester, which yielded some recommendations for the courses mapped to SO11 (Table 1). In the subsequent years, the below-listed approach was followed for A&E of SO11:

- A&E Plan for SO11: Running subsequent steps of a review cycle as: *Periodic Data Collection, Assessment, Evaluation, Recommendation for Change, Remedial Action Decision, Implementation, Re-Assessment* (Figure 1 and Table 1 and Section 7)
- Periodic data collection: gathering the rubric-based assessment reports (ISA) from Course Portfolios (CP) of the courses mapped to SO11 (every year, and in both Fall and Spring terms between 2013 and 2016) and survey data from surveys mapped to SO11 (Tables 2 & 3; Appendix-A).
- Assessment Tools (with % contribution to the overall assessment):
 - *Direct Tools*: rubric-based assessment results from compulsory courses mapped to SO11 (all at junior- and senior-year level): 70% contribution (Tables 1, 2 & 4 and Figures 2 & 3; Appendix-A)
 - *Indirect/Direct Tools*: results from answers to particular questions/statements related to SO11 assessment in various surveys (e.g., senior exit survey, internship surveys –employers and interns-, employers survey): 30% contribution (Tables 1, 3 & 4 and Figures 2 & 3; Appendix-A)
- Comprehensive A&E Approach: Application of Performance Indicator (PI)-breakdown based assessment (Figure 4 and Tables 5 & 6)
- Results of A&E Process: Assessment results presented in various ways and in multi-dimensions (Figures & Tables in Section 6)
- Recommendations: General-, A&E Plan-, course-, curriculum-, and rubric-specific recommendations for change (Tables 1 & 7 and Section 7)
- Remedial Action Decisions and Implementation: reporting and knowledge sharing, decision making-, implementation, and re-assessment processes as detailed below (Table 1 and Section 7)

1. CI-STRATEGIC PLAN (A&E PROCESS) for attainment of SO11 → The MATRIX

Continuous Improvement (CI)-Strategic Plan for assessing the level of attainment of SO11 is given in details in Table 1 and schematically presented in Figure 1. The plan **starts** with the **initial “assessment + evaluation + recommendations for change” actions** executed for the **2011-2012 Fall Semester**, then **continues** with the process during the **recent three consecutive review cycles in 2013-14 (F&S), 2014-15 (F&S), and 2015-16 (F&S)** academic years. After completion of the reviews for the 2015-16 academic year, it will **continue** with the processes scheduled according to the **“revised SO A&E Plan”** optimized as a “three-years review cycle” so to run in a step-wise manner of **“assessment → evaluation → recommendation for change → implementation → re-assessment” actions** for the **upcoming years between 2016 and 2022**.

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Table 1. CI-Strategic Plan (A&E Process) for Attainment of SO11: The Matrix (2011-2022)

Frequency/ Threshold	Data Source	Metrics	Tools	Body in charge	Action Mode	Feedback Mechanism & Actions
2011-12 Fall [≥50%]	CEV411* WW Treatment CEV441/E* Env. Modeling CEV492 Graduation Design Project	ISA reports, Rubric-based assessments	Students' performance: Team-work; using modeling software Technical drawings (Term- Project)	OCT-11 + Instructors of courses mapped to SO11	A E&R	RC-1: for [CEV411*] "apply the entire rubric w/ all 7 PIs", Apr2012 RAD-1: 2014-15 (F) I-1: 2014-15 (F&S) ReA-1: 2014-15 (F&S) RC-6: for [CEV492] "in addition to specific GDP grading-rubric; apply the entire rubric w/ all 7 PIs", Apr2012 RAD-6: 2015-16 (F) I-6: 2015-16 (S) ReA-6: 2015-16 (S) RC-a: for [CEV441*] "assessment continues as is", Apr2012
2013-14 Fall & Spring [≥50%]	CEV330/E WTP Design CEV492/E Graduation Design Project Surveys	ISA reports, Rubric-based assessments, Senior Exit Survey	Students' performance: Design Project Technical drawings (GDP) Survey Qs	OCT-11 + Instructors of courses mapped to SO11	A E&R	RC-1: for all courses "apply PI-breakdown approach in addition to overall assessment" RAD-1: 2014-15 (F) I-1: 2014-15 (F&S) ReA-1: 2014-15 (F&S)
2014-15 Fall & Spring [≥50%]	CEV328E W Suppl WW Disp CEV330/E WTP Design CEV345E Cont&Auto Fac. CEV427/E Env. Modeling CEV437/E WWTP Design CEV492/E Grad Design Project Surveys	ISA reports, Rubric-based assessments, Surveys: Senior Exit-S, Internship-S (employers), Internship-S (students)	Students' performance: Term/Design Projects Term project (team-work; using modeling software) Technical drawings (Term- Projects) Exam Qs Survey Qs	OCT-11 + Instructors of courses mapped to SO11 + DCDC + DAB	ReA E&R I	RC-1: for all courses "apply PI-breakdown approach in addition to overall assessment" RAD-1: 2014-15 (F) I-1: 2015-16 (F&S) ReA-1: 2015-16 (F&S) RC-2: for all courses "increase threshold to ≥ 60%" RAD-2: 2014-15 (S) I-2: 2015-16 (F&S) ReA-2: 2015-16 (F&S) RC-5,6: for [CEV492/E] "improve assessment by using additional tools; i.e. OBEx Q (F); by applying PI-breakdown (S)" RAD-5,6: 2015-16 (F) I-5,6: 2015-16 (F; S) ReA-5,6: 2015-16 (F; S)

A → Assessment; **E&R** → Evaluation & Recommendations; **I** → Implementations; **ReA** → Re-assessment

* CEV411 Wastewater Treatment and CEV441/E Environmental Modeling Principles courses were subjected to change in accordance with the curriculum revision / improvement works within the framework of remedial actions taken in due course of the interim/follow-up report submitted to ABET EAC in 2011 after the Exit-Statement and towards the end of the previous review cycle. The revised versions of those courses correspond to the CEV437/E WWTP Design and CEV427/E Environmental Modelling Principles courses in the current EEUP curriculum, respectively. Details of those changes will be available upon request in displayed materials at the time of on-site review (2011-ITU EEUP Interim Report; Appendix-2b. Revised Curriculum Applicable to Students Taking the Program from the 2011-2012 Academic Year Onwards)

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Table 1. CI-Strategic Plan (A&E Process) for Attainment of SO11: The Matrix (2011-2022) (cont.)

Frequency/ Threshold	Data Source	Metrics	Tools	Body in charge	Action Mode	Feedback Mechanism & Actions
2015-16 Fall & Spring [≥60%]	CEV328E W Suppl WW Disp	ISA reports, Rubric-based assessments, Surveys: Senior Exit-S, Internship-S (employers), Internship-S (students)	Students' performance: Technical drawings (HWs, Term-Projects)	OCT-11 + Instructors of courses mapped to SO11 + DCDC + DAB	ReA	RC-1: for all courses “apply PI-breakdown approach in addition to overall assessment” RAD-1: 2014-15 (F) I-1: 2016-17 (F&S) ReA-1: 2017-18 (F&S) RC-2: for all courses “increase threshold to ≥70%” RAD-2: 2015-16 (S) I-2: 2016-17 (F&S) ReA-2: 2017-18 (F&S)
	CEV330/E WTP Design		Exam Qs		E&R	RC-3: for related courses “use visual aids, etc. to improve attaining PI5& PI6” RAD-3: 2015-16 (S) I-3: 2016-17 or 2017-18 ReA-3: 2017-18
	CEV345E Cont&Auto Facil.		Term project (team-work; using modeling software)			RC-7: for [CEV345E] “change the semester of the course from 5 th to 7 th ” RAD-7: 2015-16(S), 2016-17(S) I-7: 2017-18 (F) ReA-7: to be determined
	CEV427/E Env. Modeling		Term/Design Projects			RC-8: for [RES111E] “revise/improve content & level of the course to meet needs of design-courses” RAD-7: 2015-16(S), 2016-17(S) I-8: 2017-18 (F) ReA-8: to be determined
	CEV437/E WWTP Design		Technical drawings and Advisors' Assessment using SO11 rubric (GDP)		I	RC-9&10: for SO11 A&E “revise the SO11 rubric to improve the tool and increase A&E efficiency” RAD-9&10: 2016-17 (S) I-9&10: 2017-18 (F) ReA-9&10: 2017-18 (F)
	CEV492/E Grad Design Project					
	Surveys		Survey Qs			

A → Assessment; **E&R** → Evaluation & Recommendations; **I** → Implementations; **ReA** → Re-assessment

Abbreviations (pls see Section 7 for full descriptions and timeline of RC, RAD, I, ReA):

ISA : Instructors' Self-Assessment (reports)
OCT-11 : Outcome (Assessment and Evaluation) Coordination Team for SO11
DCDC : Department Curriculum Development Committee
DAB : Department Academic Board
RC- : Recommendation for Change
RAD- : Remedial Action Decision
I- : Implementation
ReA- : Re-Assessment

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Table 1. CI-Strategic Plan (A&E Process) for Attainment of SO11: The Matrix (2011-2022) (cont.)

Frequency/ Threshold	Data Source	Metrics	Tools	Body in charge	Action Mode	Feedback Mechanism & Actions
	REVISED A&E PLAN: step-wise progress in 3-years RC-4, RAD-4: 2015-16 Spring, I-4, ReA-4: (2016-17 Fall or) 2017-18 Fall for SO11					
2016-17 Fall & Spring [≥70%]	-	-	-	-	I E&R RAD	I-1 I-2 I-3 RAD-7 RAD-8 RAD-9&10
2017-18 Fall & Spring [≥70%]	Mapped Courses Surveys	Same metrics Other metrics if needed (to be determined)	Same tools Extra tools if needed (to be determined)	OCT-11 + Instructors of courses mapped to SO11	I ReA	I-3 I-7 I-8 I-9&10 ReA: Reporting to related Committees ReA-1 ReA-2 ReA-3 ReA-6 ReA-9&10
2018-19 Fall & Spring [≥70%]	Re-Assessment Reports	Same metrics Other metrics if needed	Same tools Extra tools if needed	OCT-11+ DCDC + DAB	E&R	If needed; RC- RAD-
2019-20 Fall & Spring [≥70%] ?	RCs- RADs-	Same metrics Other metrics if needed	Same tools Extra tools if needed	OCT-11+ Instructors of courses mapped to SO11	I	If needed; I-
2020-21 Fall & Spring [≥70%] ?	Mapped Courses Surveys	Same metrics Other metrics if needed (to be determined)	Same tools Extra tools if needed (to be determined)	OCT-11 + Instructors of courses mapped to SO11	ReA	Reporting to related Committees
2021-22	-	-	-	-	-	-

A → Assessment; **E&R** → Evaluation & Recommendations; **I** → Implementations; **ReA** → Re-assessment

Abbreviations (pls see Section 7 for full descriptions and timeline of RC, RAD, I, ReA):

ISA : Instructors' Self-Assessment (reports)
OCT-11 : Outcome (Assessment and Evaluation) Coordination Team for SO11
DCDC : Department Curriculum Development Committee
DAB : Department Academic Board
RC- : Recommendation for Change
RAD- : Remedial Action Decision
I- : Implementation
ReA- : Re-Assessment

ITU EEUP's CI-Strategic Plan for SO11 is schematically presented in **Figure 1**.

2. CI-STRATEGIC PLAN (A&E PROCESS) for attainment of SO11 → The FLOWCHART
[**THE CI-LOOP: Assess → Evaluate → Recommend → Implement → Re-assess**]

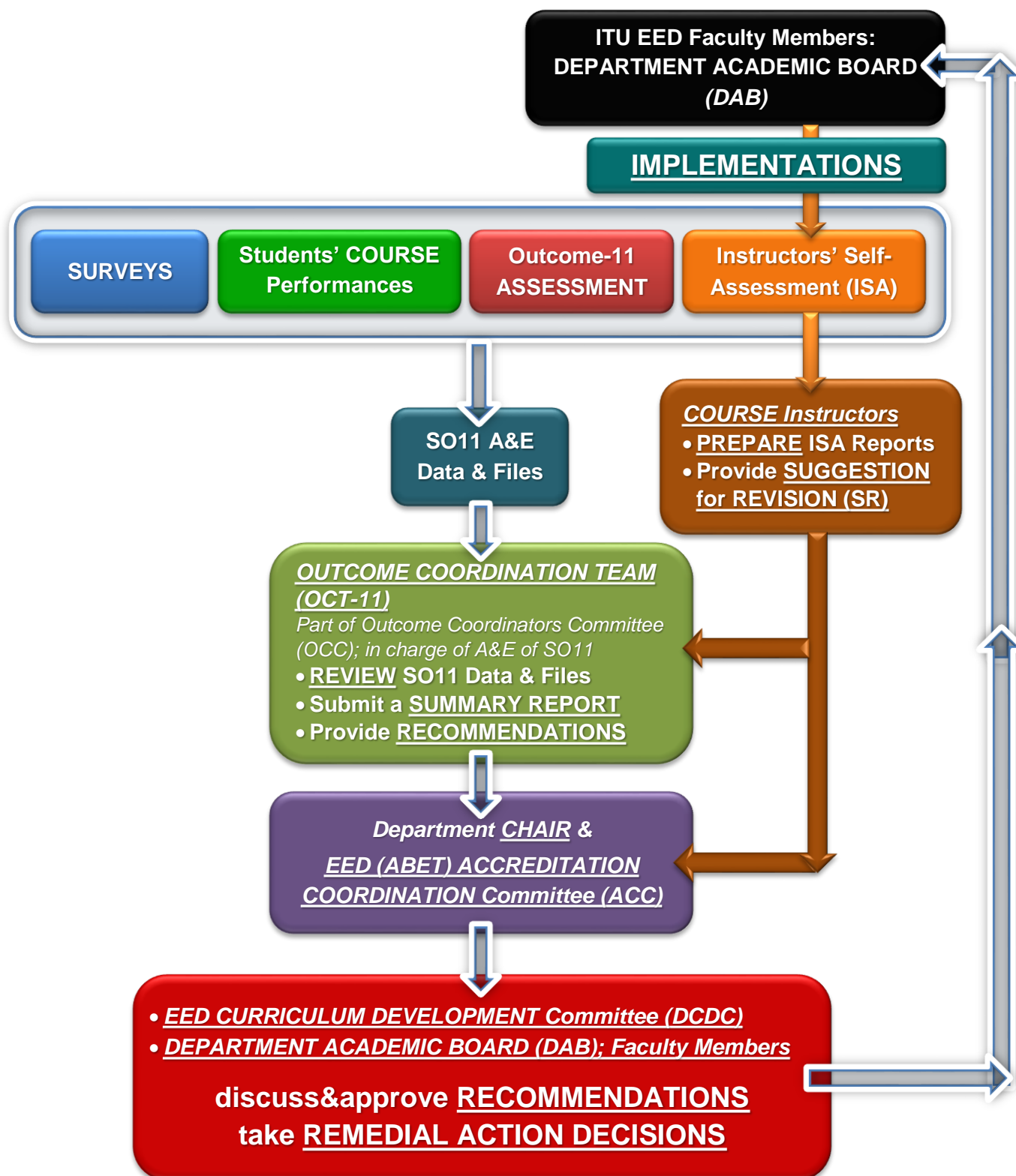


Figure 1. CI-Strategic Plan to Assess, Evaluate, and Sustain Attainment of SO11: the Flowchart

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3. OUTCOME ASSESSMENT and EVALUATION (COORDINATION) TEAM (OCT-11)

Outcome Coordinator

Assoc. Prof Ebru DULEKGURGEN (2011-cont.)

Supporting Team

TA-RA Meltem AĞTAŞ (2015-cont.)

TA-RA Hüseyin GÜVEN (2015-2016)

TA-RA Edip AVŞAR (2011-2012)

4. CURRICULUM and SURVEY MAPPING for SO11 A&E

Short lists of DIRECT and INDIRECT assessment tools used for assessing the level of attainment of the Student Outcome 11 (SO11) are provided inside the general SO A&E mapping matrices seen in **Table 2** and **Table 3**, respectively. Details of the assessment resources, tools, and data with a relative level of contribution of “[3] → **A&E**” and used in assessing the level of attainment of SO11 are given in **Appendix A, Table A-1** and **Table A-2**.

Table 2 → List of compulsory COURSES with relative contribution levels

Table 3 → List of relevant SURVEYS and A&E related short statements, questions#

Table 2. Curriculum Mapping for SO11 A&E: all Levels of Contribution (2013-2016)

COURSES [70%] share in A&E of SO11	FALL Semester	Level of Contribution*	SPRING Semester	Level of Contribution*
<i>1st year: Freshman</i>	CEV113/E	-	-	-
<i>2nd year: Sophomore</i>	CEV211/E	R		
	CEV213/E		CEV212/E	R
	CEV242/E	R	CEV228/E	I
<i>3rd year: Junior</i>	CEV327/E	R	CEV320/E	
	CEV329/E		CEV324/E	R
	CEV343/E		CEV326/E	
	CEV345/E	A&E	CEV328/E	A&E
	CEV347/E		CEV330/E	A&E
<i>4th year: Senior</i>	CEV427/E	A&E		
	CEV429/E	R		
	CEV433/E		CEV432/E	R
	CEV437/E	A&E	CEV442/E	
	CEV471/E		CEV456/E	
	CEV492/E	A&E	CEV492/E	A&E

***Table Legend for “relative level of contribution”**

[1] → I : Introduced [2] → R : Reinforced [3] → **A&E** : Emphasized; Assessed & Evaluated

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Table 3. Survey Mapping for SO11 A&E: (2013-2016)

SURVEYS <i>[30%] share in A&E of SO11</i>	Applied to;	Applied at;	Short Statement*, Question#
Senior Exit Survey	4 th year Senior Students	End of 7 th or 8 th term	"rate yourself from 1 to 5 in achieving [SO11]"
Internship Survey (Employers)	Employers	End of Summer semester following the 4 th , 6 th , 8 th terms	"rate your intern from 1 to 5 in achieving [SO11]"
Internship Survey (Students)	Interns	End of Summer semester following the 4 th , 6 th , 8 th terms	"rate your internship from 1 to 5 in helping you achieve [SO11]"
Employers Survey	Employers	Periodic (i.e., biennially)	Questions-22, -23, -25
Alumni Survey	Graduates in work force (i.e., for ≥3-5 years)	Periodic (i.e., annually)	-
Faculty/Advisory Survey	ITU EEUP Faculty members	Periodic (i.e., annually)	Question-6: "evaluate the level of achievement of SOs by EEUP"
Student Interviews	All students taking compulsory courses mapped to all 11 SOs	End of each term (i.e., 13 th or 14 th weeks)	Student inputs are evaluated by course instructors and used in developing recommendations in ISA reports
Advisory Board Meeting Inputs	Selected EEUP constituents: Employers, Professionals from public and private sector, Alumni, etc.	Periodic (i.e., biennially)	Inputs from members

*See Appendix A, Table A-2 for full statements and questions

Table Legend → **A&E: Assessed & Evaluated**

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5. ASSESSMENT RUBRIC for SO11 (ITU EED)

ITU ENVIRONMENTAL ENGINEERING UNDERGRADUATE PROGRAM							
RUBRIC for STUDENT OUTCOME-11: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice							
PI #	PI weight	Performance Indicator	UNSATISFACTORY 1 point	DEVELOPING 2 points	SATISFACTORY 3 points	OUTSTANDING 4 points	Max. Score 4.00
PI-1	1	Finding needed information /outside resources	Often does not even use the course textbook to help solve problems or homework	Looks only to class resources in solving problems and homework	Seeks information on problems from limited resources	Seeks information on problems from multiple resources	4.00
PI-2	2	Interpreting needed information /outside resources	Is not willing to use outside resources unless required	Requires assistance in interpretation of information from a small number of outside resources	Is able to interpret and understand information from limited number of outside resources	Is able to interpret and understand information from a variety of resources	8.00
PI-3	2	Selecting/using tools	Is not able to identify and/or use the right tools for a particular problem or project	Needs some guidance in selecting and/or using appropriate tools for a particular problem or project	Can usually identify and/or use tools that might fit a particular problem or project	Can identify and/or use appropriate tools effectively in assignments or projects	8.00
PI-4	1	Computer skills	Struggles with simple tasks in PC use and/or is unable to use current software packages	Can perform simple tasks requiring PC use and /or use of current software packages	Can perform necessary tasks requiring PC use and /or use of current software packages	Maintains current, state-of-the-art abilities in PC use and use of current software package	4.00
PI-5	2	Using specialized engineering tools , such as simulations, graphical techniques, etc.	Uses in assignments or classroom work when guided by the instructor	Uses in assignments or classroom work without help of the instructor	Uses in design projects where the professor chooses, restricts, or helps in the selection of the tools. Students analyze and validate the results.	Uses in design projects where students make an appropriate choice of the tool. Students analyze and validate the results.	8.00
PI-6	1	Using other modern tools and instruments for Environmental Engineering applications	Cannot use other modern tools and instruments for Environmental Engr.	Poor or improper use of other modern tools and instruments for Environmental Engr.	Satisfactory use of other modern tools and instruments for Environmental Engr.	Extensive use of other modern tools and instruments for Environmental Engr.	4.00
PI-7	1	Using library resources	Does not use the library	Requires assistance in locating materials from the library	Understand the use of the library	Understand the organization and use of the library	4.00
	10	OVERALL PERFORMANCE	UNSATISFACTORY	DEVELOPING	SATISFACTORY	OUTSTANDING	TOTAL
		POINTS REQUIRED	0-10	11-20	21-30	31-40	40.00

6. RESULTS and DISCUSSION of A&E PROCESS for ATTAINMENT of SO11 (2013-2016)

6.1. Performance Vector (PV) Breakdown and Direct- vs Indirect- Tools

Results of the A&E process run in Fall and Spring Semesters of 2013-14, 2014-15, and 2015-16 are presented together in **Figure 2** and **Table 4** with performance vector details, i.e., percentages in “Unsatisfactory”, “Developing”, “Satisfactory”, “Outstanding” categories, as well as “at or above Satisfactory”; the latter being the sum of percentages in “Satisfactory” and “Outstanding” categories.

For the academic years prior to 2014-2015, the threshold for the level of attainment of all SOs, incl. SO11, was set by the EED as “**at or above Satisfactory $\geq 50\%$** ”. The SO A&E results available for that period showed that the level of attainments in all 11 SOs were above the set threshold of $\geq 50\%$. Those results were evaluated jointly by the *Department ABET Accreditation Coordination Committee (ACC)* and the *Outcome Coordinators Committee (OCC)* and it was suggested to increase the threshold to $\geq 60\%$ (early 2015). This recommendation was fed to the internal SO A&E process (Figure 1), and was discussed and approved by the faculty members in the *EED-Academic Board (DAB)* meeting (Spring 2015). Approved remedial action decision was communicated to the entire faculty, as well as to the Outcome Coordinators. Accordingly, the new threshold for the level of attainment of SOs was applied as “**at or above Satisfactory $\geq 60\%$** ” for the first time in 2015-16 Fall Semester. The statement used for addressing the successful attainment of SO11 is given below.

SO11 Assessment in Numbers → “attainment CRITERION for SO: the THRESHOLD”

[SO11 is considered to have been attained successfully if the weighted average of the DIRECT (courses; 70% share) and INDIRECT (surveys; 30% share) assessment results are in 50% [60%] or more at “Satisfactory” + “Outstanding” categories:

DIRECT tools: students’ performances in courses are assessed using rubrics (ISA reports) and

INDIRECT tools: survey attendees rank the SO achievement in assigned surveys]

As seen from Figure 2 and Table 4, level of attainment of SO11 was above the set threshold values in all three consecutive review cycles (*threshold being “at or above Satisfactory $\geq 50\%$ and $\geq 60\%$ ” for 2013-14, 2014-15, and 2015-16, respectively*). Then again, the values determined for the last two cycles were lower than those in 2013-14. One possible reason of that is the computational bias introduced to the process by having a limited assessment pool in 2013-14 compared to the recent years: in 2013-2014 data was available only from 2 courses and 1 survey w/ 6 attendees, whereas in 2014-15; 6-7 courses and 3 surveys, and in 2015-16; 6-7 courses and 4 surveys fed data to A&E (Table 4). Therefore, values for the last two years are considered to be more realistic in showing the actual level of attainment of SO11. Note that in addition to those comparative overall assessments, results and analysis of the PI-breakdown approach are presented in the following section to provide a more realistic and informative data set for comprehensive comparative A&E of SO11.

A&E results obtained by using the direct- and indirect- tools and prior to adjustment for weighted average are presented side-by-side in **Figure 3** and **Table 4**. As apparent from the presented data, results obtained from indirect tools (surveys) were usually lower than those obtained from direct tools (courses-rubrics). This difference was attributed to the different natures of those assessment tools/methods: (i) assessment process in courses (using rubrics) span over the entire term and most likely have multiple inputs of different sorts (exam Qs, HWs, projects, term-papers, etc.) available for assessment, whereas (ii) assessment via surveys take no longer than 1 hour and results depend on the perception of individuals; and thus (iii) the latter being more subjective; and also (iv) survey attendees may not be very-well informed about the nature and significance of the A&E process, which then may introduce another bias to the process. To overcome those possible biases, the contribution of the direct tools to the overall A&E process was determined as 70%, whereas that of the indirect tools as 30%.

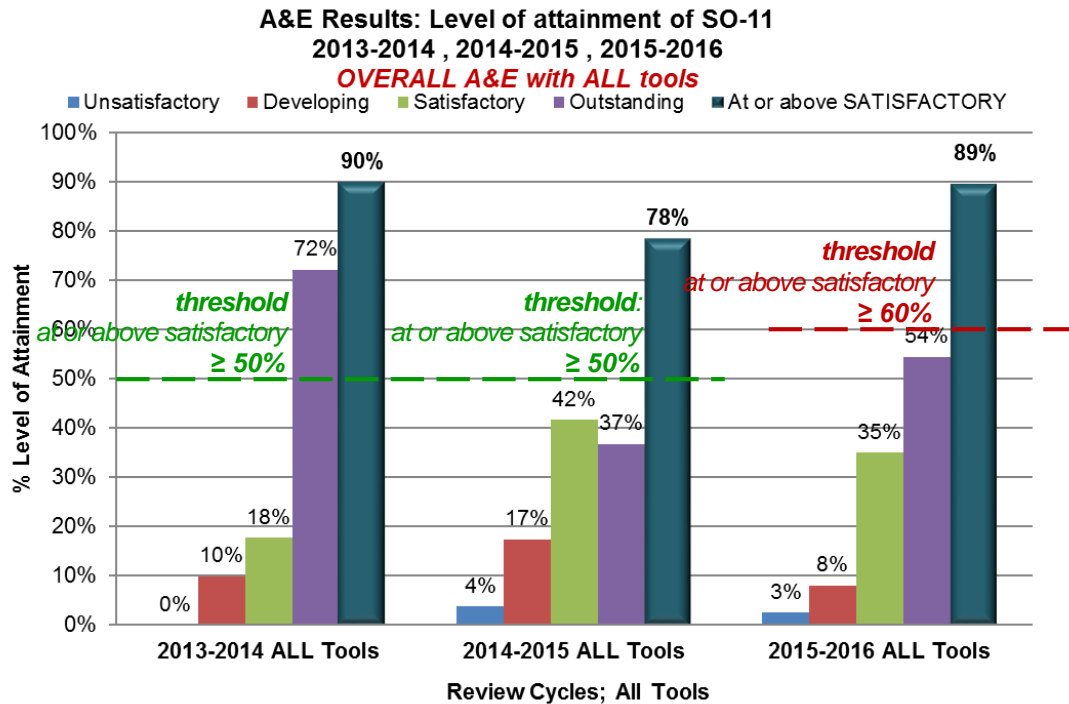


Figure 2. Comparative Results of A&E Process for SO11 with PERFORMANCE VECTOR Details
 - All Tools and All Data: 2013-2014 (F & S) / 2014-2015 (F & S) / 2015-2016 (F & S)

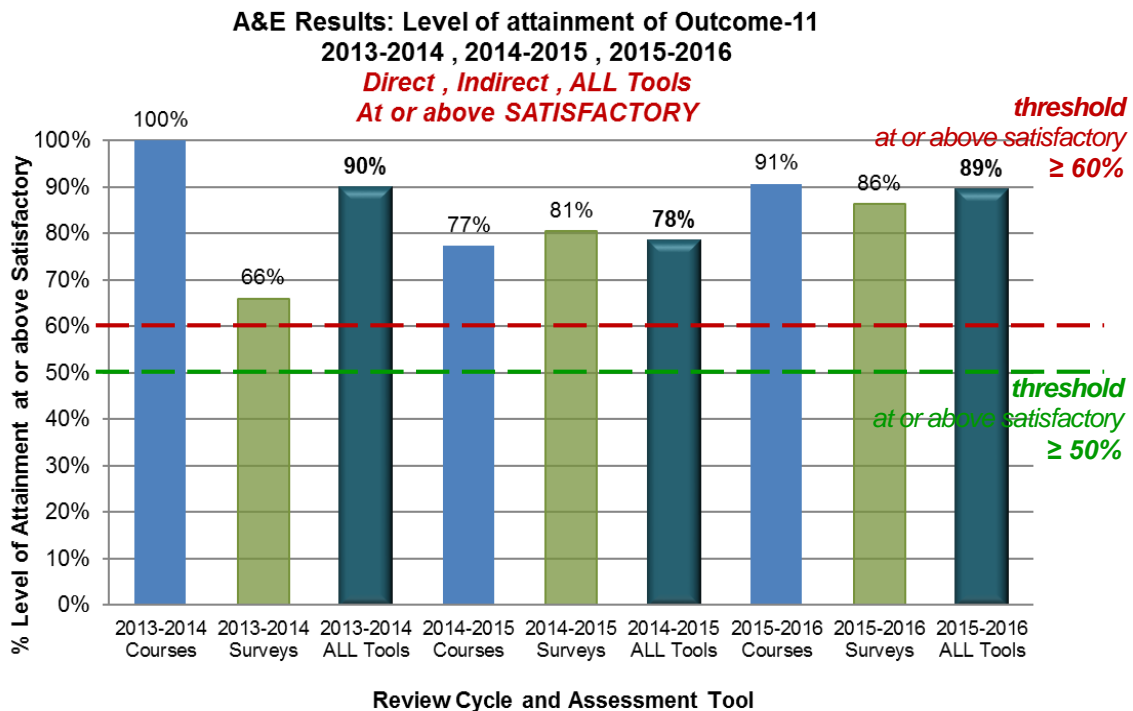


Figure 3. Comparative Results of OVERALL and DIRECT-, INDIRECT- Tools Specific A&E Process for SO11 - All Data: 2013-2014 (F & S) / 2014-2015 (F & S) / 2015-2016 (F & S)

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Table 4. Comparative Results of OVERALL and DIRECT-, INDIRECT- Tools Specific A&E Process for SO11 - All Data: 2013-2016

Contribution	Review Cycle	Semester	Course Code / Survey Type	No of students/ attendees	Unsatisfactory	Developing	Satisfactory	Outstanding	At or above SATISFACTORY
	2013-2014	Fall	CEV492	18	0%	0%	0%	100%	100%
	2013-2014	Spring	CEV330, CEV330E, CEV492/E	92	0%	0%	22%	78%	100%
70%	2013-2014	Academic Year	CEV492, CEV330, CEV330E, CEV492/E	110	0%	0%	11%	89%	100%
30%	2013-2014	Academic Year	SENIOR EXIT SURVEY	6	0%	33%	33%	33%	66%
	2013-2014	Academic Year	ALL TOOLS	116	0%	10%	18%	72%	90%
Contribution	Review Cycle	Semester	Course Code / Survey Type	No of students/ attendees	Unsatisfactory	Developing	Satisfactory	Outstanding	At or above SATISFACTORY
	2014-2015	Fall	CEV345E, CEV427, CEV427E, CEV437, CEV437E, CEV492/E	151	3%	13%	57%	27%	83%
	2014-2015	Spring	CEV328E, CEV330, CEV330E, CEV492/E	156	6%	23%	39%	33%	72%
70%	2014-2015	Academic Year	CEV345E, CEV427, CEV427E, CEV437, CEV437E, CEV492/E, CEV328E, CEV330, CEV330E, CEV492/E	307	5%	18%	48%	30%	77%
30%	2014-2015	Academic Year	SENIOR EXIT SURVEYS, INTERNSHIP SURVEYS (EMPLOYERS & STUDENTS)	324	2%	16%	27%	53%	81%
	2014-2015	Academic Year	ALL TOOLS	631	4%	17%	42%	37%	78%
Contribution	Review Cycle	Semester	Course Code / Survey Type	No of students/ attendees	Unsatisfactory	Developing	Satisfactory	Outstanding	At or above SATISFACTORY
	2015-2016	Fall	CEV345E, CEV427, CEV427E, CEV437, CEV437E, CEV492/E	204	1%	13%	46%	40%	86%
	2015-2016	Spring	CEV328E, CEV330, CEV330E, CEV492/E	171	3%	2%	29%	66%	95%
70%	2015-2016 Courses	Academic Year	CEV345E, CEV427, CEV427E, CEV437, CEV437E, CEV492/E, CEV328E, CEV330, CEV330E, CEV492/E	375	2%	7%	37%	53%	91%
30%	2015-2016 Surveys	Academic Year	SENIOR EXIT SURVEYS, INTERNSHIP SURVEYS (EMPLOYERS & STUDENTS), EMPLOYERS SURVEY	319	4%	9%	29%	57%	86%
	2015-2016	Academic year	ALL TOOLS	694	3%	8%	35%	54%	89%

6.2. Performance Indicator (PI) Breakdown

In addition to the overall assessments presented above, performance indicator (PI)-based assessment of SO11 is also available for Fall and Spring Terms in 2014-15 and 2015-16 academic years. Results of the A&E Process for SO11 carried out in 3 consecutive years, using all available assessment tools, both at an overall SO-level presenting a general frame for level of attainment, as well as at PI-specific level owing to implementation of PI-breakdown based assessment are presented together in **Figure 4**. While results at **overall SO-level** are considerably above the set threshold values; **indicating a high level of attainment of SO11 in all review cycles**, the **PI-breakdown results clearly identify particular PIs with lower outputs** (e.g., *PI5: "using specialized engineering tools, such as simulations, graphical techniques, etc."*, and *PI7: "using library resources"*), providing further information on students' skills/abilities and particularly pointing to their weaknesses/deficiencies in the fields addressed by specific PIs, and thus **referring to the need for improvement**.

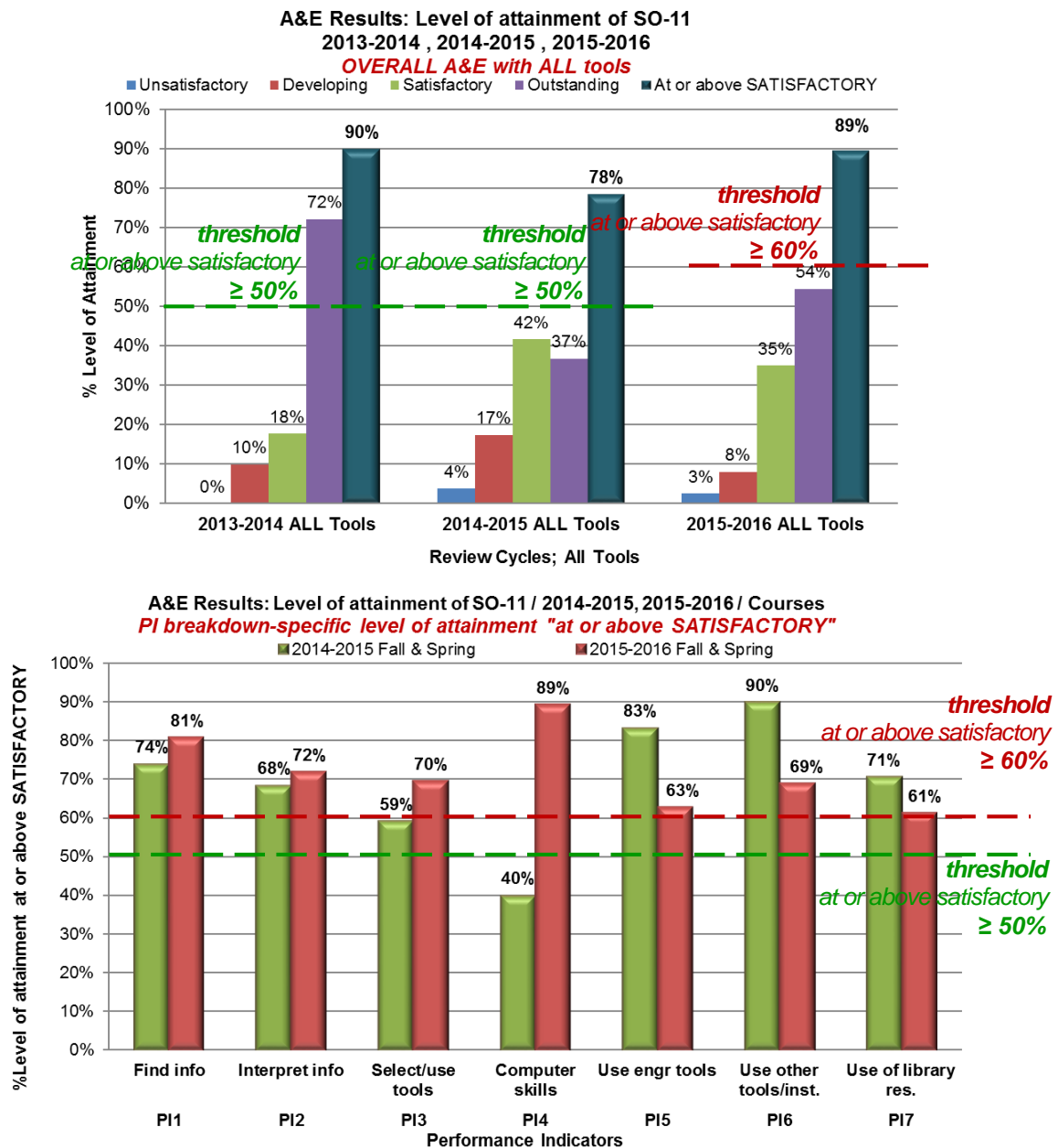


Figure 4. Comparative Results of OVERALL and PI-SPECIFIC A&E Process for SO11 - All Tools and All Data: 2013-2014 (F & S) / 2014-2015 (F & S) / 2015-2016 (F & S)

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6.3. Comparative Evaluation (2014-15 vs 2015-16) and Interpretation of the PI-specific Data

In order to be able to identify the impact and contribution of the individual courses on the results of the PI-breakdown based assessment, PI-specific data (% at or above satisfactory level) obtained from the courses mapped to SO11 are summarized in **Table 5** and comparatively presented for the 2 consecutive years (2014-15 and 2015-16) in **Table 6**.

Reasons for the achievements/shortcomings and suggestions for revisions (SR) provided by the instructors of the courses in their annual ISA reports are summarized in **Table 7**.

This way, it was aimed at determining the individual outputs of the relevant courses in terms of level of attainment of each PI of SO11, linking those to lump-sum PI-specific data, enabling comparative evaluation and comprehensive interpretation of the results, summarizing reasons and suggestions for revisions (SR) from the instructors, so to be able to derive conclusions from the SO11 A&E – as listed below- and provide recommendations for change (RC) for future practices - as presented in the next section:

Table 5. Performance Indicator (PI)-specific Data for SO11 A&E (2014-2016)

2014-2015 Fall and Spring								2014-2015 Fall & Spring
Mapped Courses	3 rd -year: Juniors		4 th -year: Seniors					At or above SATISFACTORY
	CEV345E	CEV328E	CEV427	CEV427E	CEV437	CEV437E	CEV492/E	
PI1- Find info	60%	34%	83%	67%	100%	100%	-	74%
PI2- Interpret info	43%	34%	67%	67%	100%	100%	-	68%
PI3- Select/use tools	47%	92%	17%	0%	100%	100%	-	59%
PI4- Computer skills	43%	100%	17%	0%	-	-	-	40%
PI5- Use engr. tools	-	100%	83%	33%	100%	100%	-	83%
PI6- Use other tools/inst	-	100%	83%	67%	100%	100%	-	90%
PI7- Use of library res.	60%	73%	83%	67%	-	-	-	71%

2015-2016 Fall and Spring								2015-2016 Fall & Spring
Mapped Courses	3 rd -year: Juniors		4 th -year: Seniors					At or above SATISFACTORY
	CEV345E	CEV328E	CEV427	CEV427E	CEV437	CEV437E	CEV492/E	
PI1- Find info	83%	84%	86%	78%	78%	58%	100%	81%
PI2- Interpret info	22%	84%	71%	100%	72%	54%	100%	72%
PI3- Select/use tools	57%	70%	29%	67%	84%	82%	100%	70%
PI4- Computer skills	100%	73%	100%	89%	84%	81%	100%	89%
PI5- Use engr. tools	9%	93%	71%	33%	77%	68%	89%	63%
PI6- Use other tools/inst	100%	73%	43%	33%	77%	69%	89%	69%
PI7- Use of library res.	83%	84%	0%	33%	82%	61%	86%	61%

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Table 6. Comparison of the Performance Indicator (PI)-specific Data for SO11 A&E (2014-2016)**

	2014-2015 → 2015-2016 (Fall and Spring)							2014-2015 → 2015-2016 (F & S)	Ref: Table 7 (from ISA reports)*	
	3 rd -year: Juniors		4 th -year: Seniors							
Mapped Courses	CEV345E	CEV328E	CEV427	CEV427E	CEV437	CEV437E	CEV492/E	At or above SATISFACTORY	Reason	SR
PI1- Find info	↑ 60% → 83%	↑↑ 34% → 84%	↔ 83% → 86%	↑ 67% → 78%	↓ 100% → 78%	↓↓ 100% → 58%	- → 100%	↔ 74% → 81%	1, 4, 6	9
PI2- Interpret info	↓↓ 43% → 22%	↑↑ 34% → 84%	↔ 67% → 71%	↑↑ 67% → 100%	↓↓ 100% → 72%	↓↓ 100% → 54%	- → 100%	↔ 68% → 72%	6, 11	11, 12
PI3- Select/use tools	↑ 47% → 57%	↓ 92% → 70%	↑ 17% → 29%	↑↑ 0% → 67%	↓ 100% → 84%	↓ 100% → 82%	- → 100%	↑ 59% → 70%	1, 6, 10, 11	7, 11, 12
PI4- Computer skills	↑↑ 43% → 100%	↓↓ 100% → 73%	↑↑ 17% → 100%	↑↑ 0% → 89%	- → 84%	- → 81%	- → 100%	↑↑ 40% → 89%	2, 5, 14	5
PI5- Use engr. tools	- → 9%	↔ 100% → 93%	↓ 83% → 71%	↔ 33% → 33%	↓ 100% → 77%	↓↓ 100% → 68%	- → 89%	↓↓ 83% → 63%	3, 5, 7, 10, 11	3, 4, 5, 8, 12, 15
PI6- Use other tools/ instruments	- → 100%	↓↓ 100% → 73%	↓↓ 83% → 43%	↓↓ 67% → 33%	↓ 100% → 77%	↓↓ 100% → 69%	- → 89%	↓↓ 90% → 69%	2, 5, 7, 14	3, 4, 5, 8, 12, 15
PI7- Use of library res.	↑ 60% → 83%	↑ 73% → 84%	↓↓ 83% → 0%	↓↓ 67% → 33%	- → 82%	- → 61%	- → 86%	↓ 71% → 61%	4	9

**“Reasons for those achievements(/shortcomings)” and “suggestions for revisions (SR)” provided by the course instructors in their annual ISA reports are summarized in Table 7.

**Color Legend for the table → ↑ : Increased ↓ : Decreased ↔ : Minor change

PI1 - Finding needed information/outside resources

- From 2014-15 to 2015-16, there is a slight increase in this PI from 74 to 81%.
- Increases and decreases in the relevant courses seem to balance each other, resulting in a slight increase.
- Increase in CEV328E and decrease in CEV437E are significant.
- In sum; ability of the junior and senior year students to “*find needed information/outside resources*” is at a high level.
- Reasons for those achievements were addressed and suggestion for revisions were offered by the instructors of those courses in their ISA reports and listed in Table 7: Reason-1, 4, 6 and SR-9.

PI2 - Interpreting needed information/outside resources

- From 2014-15 to 2015-16, there is a slight increase in this PI from 68 to 72%.
- Increases and decreases in the relevant courses seem to balance each other, resulting in a slight increase.
- Increase in CEV328E, CEV427E and decrease in CEV345E and CEV437E are significant.
- In sum; ability of the junior and senior year students to “*interpret needed information/outside resources*” is at a high level.
- Reasons for those achievements were addressed and suggestion for revisions were offered by the instructors of those courses in their ISA reports and listed in Table 7: Reason-6, 11 and SR-11, 12.

PI3 - Selecting/using tools

- From 2014-15 to 2015-16, there is an increase in this PI from 59 to 70%.
- While results from the courses fluctuate within 10-20%, main contribution to the lump-sum increase comes from the improvement in CEV427E (from 0 to 67%)
- In sum; ability of the junior and senior year students to “*select/use tools*” is at a high level.
- Reasons for those achievements were addressed and suggestion for revisions were offered by the instructors of those courses in their ISA reports and listed in Table 7: Reason-1, 6, 10, 11 and SR-7, 11, 12.

PI4 - Computer skills

- From 2014-15 to 2015-16, there is a major increase in this PI from 40 to 89%.
- Main contributions to that major increase come from the significant improvements in CEV345E, CEV427, and CEV427E. Significantly high results obtained from CEV437, CEV437E, and CEV492/E in 2015-16 have an apparent positive impact on level of attainment of this PI as well.
- In sum; “*computer skills*” of the junior and senior year students are at a high level.
- Reasons for those achievements (and shortcomings in CEV328E) were addressed and suggestion for revisions were offered by the instructors of those courses in their ISA reports and listed in Table 7: Reason-2, 5, 14 and SR-5.

PI5 - Using specialized engineering tools, such as simulations, graphical techniques, etc.

- From 2014-15 to 2015-16, there is a decrease in this PI from 83 to 63%.
- Except for CEV328E and CEV492/E, results from the other courses are either considerably low or decreased compared to the previous year.
- In sum; ability of the junior and senior year students to “*use specialized engineering tools, such as simulations, graphical techniques, etc.*” is at a moderate level. Accordingly, those results clearly indicate the need to take certain measures so to obtain improvement in future applications.
- Reasons for those shortcomings were addressed and suggestion for revisions were offered by the instructors of those courses in their ISA reports and listed in Table 7: Reason-3, 5, 7, 10, 11 and SR-3, 4, 5, 8, 12, 15.

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PI6 - Using other modern tools and instruments for Environmental Engr. applications

- From 2014-15 to 2015-16, there is a decrease in this PI from 90 to 69%.
- Main contribution to that decrease seem to originate from the significant decreases in CEV427, CEV427E, and partly that in CEV437E, whereas results from CEV345E and CEV492/E are considerably high.
- In sum; ability of the junior and senior year students to “use other modern tools and instruments for Environmental Engr. applications” is at a moderate-to-high level. Those results imply that there is still some room for improvement in students’ performance in the relevant field.
- Reasons for those shortcomings (and achievement in CEV345E) were addressed and suggestion for revisions were offered by the instructors of those courses in their ISA reports and listed in Table 7: Reason-2, 5, 7, 14 and SR-3, 4, 5, 8, 12, 15.

PI7 - Using library resources

- From 2014-15 to 2015-16, there is a decrease in this PI from 71 to 61%.
- Main contribution to that decrease comes from the major decreases in CEV427 and CEV427E, whereas results from the other courses are mostly high.
- In sum; ability of the junior & senior year students to “use library resources” is at a moderate level.
- Reason for the achievement in CEV328E was addressed and suggestion for revision in CEV427/E was offered by the instructors of those courses in their ISA reports and listed in Table 7: Reason-4 and SR-9.

Table 7. A&E Outputs from the Courses Mapped to SO11: Reasons and Suggestions for Revisions from the Instructors (SR) (extracted from ISA reports; 2014-15 and 2015-16)^{a,b}

(3 rd year/F)	CEV345E	Control and Automation in Environmental Facilities
14-15	Reason	No PI-specific comment
	SR-1	(All PIs) Change the semester of the course from 5th to 7th (based on both instructor’s evaluation and end-of term student interviews): “The term of this lecture is too early since the level of course (topics given in Course Catalog Form) and the content given are quite high for the students enrolled in the 5th Semester. This lecture is more relevant for the students whom were previously involved in project design lectures. So, the suggestion of revision is to change the semester of the course from 5th to 7th (or 8th) semester of the environmental engineering education” (ISA report).
15-16	Reason1	Increases in PI1, PI3 → “An experienced expert was invited to give up to date information and relevant standards used in the real sector. In that way, the students were able to understand how P&ID was prepared in the field of environmental engineering. Moreover, they became aware of the standards used in real sector” (ISA report).
	Reason2	Increase in PI4, PI6 → “computer application and exercise sessions (incl., drawing exercise with AutoCAD) were included in the course” (ISA report).
	Reason3	New assessment of PI5 → ability of student to run “simulations” were assessed for the first time (OCT meeting minutes; 25.05.16). Results were low (9% at or above satisfactory).
	SR-2	(All PIs) Change the semester of the course from 5th to 7th and its prerequisites (based on both instructor’s evaluation and end-of term student interviews): “The term of this lecture is too early since the level of course (topics given in Course Catalog Form) and the content given are quite high for the students enrolled in the 5th Semester. This lecture is more relevant for the students whom were previously involved in project design lectures. So, the suggestion of revision is to change the semester of the course from 5th to 7th (or 8th) semester of the environmental engineering education. The prerequisites of this course should be “Wastewater Treatment Design (CEV437E)” and “Water Treatment Plant Design (CEV330E)” (ISA report).
	SR-3	(All PIs) Offer the course in 2 cohorts w/ 2 instructors & in larger computer labs (based on both instructor’s evaluation and end-of term student interviews): To optimize number of students, classroom, computer lab capacities, esp. during exercise sessions (students using drawing software in their P&ID exercises) so to allocate sufficient time for students for their questions (ISA report).

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(3 rd year/S)	CEV328E	Water Supply and Wastewater Disposal
14-15	Reason	No PI-specific comment (first time the course given by the particular instructor)
	SR-4	Better guidance to be given to the students for the term project assignment "A more thorough guidance for the term project will be given to the students in order to increase the success rate of the project." (ISA report).
15-16	Reason4	Increases in PI1, PI7 → "Students were encouraged to find and use outside resources by the instructor and the course assistants" (ISA report).
	Reason5	Decrease in PI4, PI5, PI6 → "A more thorough guidance for the drawings in the term project was given to the students in order to increase the success rate of the project, however, the students still struggled with the use of the AutoCAD software" (ISA report).
	SR-5	(PI4, PI5, PI6) Revision/Improvement of RES111E Technical Drawing (CAD) course to meet the needs of the future design projects "A more thorough guidance for the drawings in the term project was given to the students in order to increase the success rate of the project, however, the students still struggled with the use of the AutoCAD software. The first semester course RES 111E Technical Drawing (CAD) should be revised to meet the needs of the future design projects" (ISA report).
(4 th year/F)	CEV427/E	Environmental Modelling Principles
14-15	Reason	No PI-specific comment
	SR-6	Better guidance to be given to the students for the term project assignment "an example of a comprehensive project may be given to the students for better understanding of the concept of the term project" (ISA report).
15-16	Reason6	Increases in PI2, PI3 → "increasing office hours, providing feedback to the students on their draft submissions, allowing students to revise their submissions" (ISA report).
	SR-7	(PI3) More problem sessions "More problem sessions planned to be conducted for the future semester according to the students' suggestions" (ISA report).
	SR-8	(PI5, PI6) Better guidance and more exercise on use of software "The student interviews indicated that the recitations regarding the implementation of the software (GoldSim) should be increased" (ISA report).
	SR-9	(PI1, PI7) Better guidance on literature search "Planned to give information on carrying out scientific literature research, available scientific tools such as Web of Science, Scopus databases, e-books and encourage students to follow related periodicals regularly" (ISA report).
(4 th year/F)	CEV437/E	Wastewater Treatment Plant Design
14-15	Reason	No PI-specific comment
	Reason7	(PI5) "The students were not experienced in technical drawings, etc. for their design. Hence, additional lecture time was devoted to share information and as-built drawings of real WWTPs. External experts were invited to show the methodology of applying those techniques using AutoCAD program" (ISA report).
	Reason8	"To show real engineering experiences from the sector, 2 experts were invited to give seminars at the end of the semester..... The students became aware of selection of equipment together with general cost issues in wastewater treatment." (ISA report).
	SR-10	Better harmonization of the practice session with the course content "Practice session will be reorganized & processed parallel to the course content" (ISA report).
	SR-11	More exercises in practice session "More exercises will be solved in practice session" (ISA report).
15-16	Reason9	"Periodic meetings (2 hours every 2 weeks) were organized together with project groups under the supervision of the lecturers, to discuss the project in detail with the students. Students gave positive feedbacks for "project discussion sessions" (ISA report).
	Reason10	(PI3, PI5) "Number of students in project groups was reduced, which enabled spending more time answering the questions from the student, and made it easier to assess the students in terms of selecting/using design methodology, engineering tools etc." (ISA report).
	Reason11	(PI2, PI3, PI5) "More exercises were solved in practice sessions: that enabled students apply and develop their individual abilities of design of WWTP facility. Students' questions regarding the exercises solved were answered by the lecturers of the course during "project discussion sessions" that were organized periodically" (ISA report).
	SR-12	(PI3, PI5, PI6) Better guidance and step-wise examples for design project "The exercise sessions will be revised to include design of a selected project step by step." (ISA report).

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(4 th year/ S&F)	CEV492/E	Graduation Design Project
14-15	Reason	No PI-specific comment
	SR	No PI-specific suggestion for revision
15-16	Reason12 (SR-13)	<u>(All PIs) Addition of a new assessment tool for a more comprehensive and realistic A&E process (Fall)</u> Until Fall 2015-2016, assessment of OC11 by the GDP had been done by using only a particular section of the "Course Specific Rubric" devoted for evaluating the technical and architectural drawings chapter of the project final report. For a more comprehensive and realistic A&E process, "another assessment tool (a specific question asked in the outcome based exam; OBEx) was included in Fall 2015-2016: contribution of the drawing part in the 'Course Specific Rubric' was 40% and that of OBEx-Q was 60%" (ISA report).
	Reason13 (SR-14)	<u>(All PIs) Addition of a new assessment approach for a more comprehensive and realistic A&E process (Spring)</u> For a more comprehensive and realistic A&E process, "another assessment tool (PI-breakdown based assessment by the team-advisors) was included in Spring 2015-2016: contribution of assessment of drawings chapter (Course Specific Rubric) was 50% and that of PI-breakdown assessment by the team-advisors using SO11 rubric was 50%" (ISA report).
	Reason14 SR-15	<u>(PI4, PI5, PI6) Revision/Improvement of RES111E Technical Drawing (CAD) course to meet the needs of the GDP course</u> "It was noticed that all the students have not been fully introduced with the same level of modern computer aided design software programs (CAD). Hence, a Technical Drawing course (Technical Drawing I (CAD/RES 111) (1+2)) and a Computer Supported Design course (Technical Drawing II (3D AutoCAD) (1+2)) might be offered by the experienced instructors" (ISA report).

^a Not all but selected outputs from the ISA reports of the instructors, who implemented the PI-breakdown based assessment approach, are included.

^b The underlined SRs provided by the instructors are adapted to the "Recommendation for Change (RC)" list prepared by the OCT-11 (see Section 7).

Reason : Selected items reported by the Instructors of the courses in their ISA reports, under sub-section; "**Reasons for those Achievements (Shortcomings)**".

SR- : **Suggestion for Revision from Instructor**: Selected items suggested by the Instructors of the courses in their ISA reports, under sub-section; "**Suggestion for Revision**".

7. RECOMMENDATIONS for CHANGE, REMEDIAL ACTION DECISIONS, IMPLEMENTATION (2013-2016 and FURTHER)

Based on the **results of the A&E process** to assess, evaluate, and sustain successful attainment of SO11 presented in the preceding sections, it is possible to **conclude that the ITU EEUP is successful and efficient in achieving SO11 above the set threshold values.**

Yet the results of the **PI-breakdown** based assessment approach **highlights some points of students' weaknesses/deficiencies in the fields addressed by specific PIs (PI5, PI6, PI7)**, referring to the **need for change & improvement** and also provides guidance for the downstream elements of the A&E process.

Accordingly, "**Recommendations for Change**" based on the results of the A&E process for assessing the level of attainment of SO11, following "**Remedial Action Decisions**", and "**Implementation Plans**" applied between 2011 and 2016 in accordance with the ITU-EEUP's strategic plan (**Figure 1**) were shortly provided at the beginning of this report in **Table 1**, and are summarized below for the most recent three consecutive review cycles (2013-2014, 2014-2015, 2015-2016), together with the ones proposed for the upcoming 3-years step-wise A&E plan.

Further details, including meeting minutes of the related committees (ACC, DCDC, and DAB) -where Recommendations for Change (RC) were discussed, finalized, and approved, Remedial Action Decisions (RAD) were taken, and Implementation (I) schedule was proposed- are available in the EED achieves as hard-copies. Some of those information are also available on-line from the "Accreditation" link of the publically accessible official web-site of the ITU-EED at the following URL:

<http://www.cevre.itu.edu.tr/en/accreditation/abet>

Recommendation for Change (RC-) Step

- Based on the results of the SO11 A&E Process (between 2011 and 2016, and mostly in the most current three consecutive review cycles)
- Mostly offered by the OCT-11 and some by the ACC and DCDC; also including some of the "**Suggestions for Revision (SR-)**" by the instructors of the courses mapped to SO11
- Total of 10 RCs offered and communicated to the relevant parties (instructors of the courses, GDP Coordination Team, OCC, ACC, DCDC, EED Administration)

Remedial Action Decision (RAD-) and Implementation (I-) Steps

- **Preparation and dissemination of SO11 A&E reports** to the EED Administration and the relevant committees (**Department Curriculum Development Committee [DCDC], (Department ABET) Accreditation Coordination Committee [ACC], Outcome Coordinators Committee [OCC]; ITU-EED Academic Board [DAB] Meetings**)
- **Recommendations** discussed and approved
- **Remedial Action Decisions** taken and communicated to the related parties (i.e., instructors of the courses mapped to SO11)
- **Implementation** of remedial actions in the courses in the following semester
- **Re-assessment**

Recommendation (RC-), Remedial Action Decision (RAD-), Implementation (I) SUMMARY

RC-1 / Generic

Strong advice on implementation of the PI-breakdown based assessment approach for all courses mapped to SO11

- Recommendation (initial) by OCT-11 → 2011-12 Spring
- Remedial Action Decision taken (OCC, ACC, DAB) → 2014-15 Fall
- Implementation (partial) by Instructors → 2014-15 and 2015-16
- Re-Assessment → 2014-15 and 2015-16

RC-2 / Generic

Increase the threshold “at or above satisfactory” from $\geq 50\%$ to $\geq 60\%$ and then to $\geq 70\%$

- Recommendation by ACC → 2014-15 Spring and 2015-16 Spring
- Remedial Action Decision taken (ACC, DCDC, DAB) → 2014-15 Spring and 2015-16 Spring
- Implementation by Instructors, OCC, ACC → 2015-16 (and 2016-17)
- Re-Assessment → 2015-16 (and 2017-18)

RC-3 / Generic

Use of visual aids and multi-media resources (animations, videos, simulations, etc.) as supporting materials in courses mapped to SO11 to help improve student performance, esp. related to *PI5 (use engineering tools)* and *PI6 (use other modern tools, instruments, etc.)*

- Recommendation by ACC, DCDC → 2015-16 Spring
- Remedial Action Decision taken (ACC, DCDC, DAB) → 2015-16 Spring
- Implementation by Instructors → to be in 2016-17 or 2017-18
- Re-Assessment → to be in 2016-17 or 2017-18
 - Also SR-8 by the instructors of CEV427/E in their 2015-16 Fall ISA report (Table 7)

RC-4 / A&E Plan-specific

Changing the frequency of the A&E plan from an annual cycle to a 3-years cycle of: 1st-year: *Data Collection and Assessment*, 2nd-year: *Evaluation and Recommendations for Improvement*, 3rd-year: *Remedial Action Decision and Implementation*, (4th-year: *Re-assessment*)

- Recommendation by ACC → 2015-16 Spring
- Remedial Action Decision taken (ACC, DCDC, DAB) → 2015-16 Spring
- Implementation by OCC, ACC → 2016-17 Fall
- Re-Assessment → starting 2016-17 (2017-18 F for SO11)

RC-5 / Course-specific: CEV492/E Graduation Design Project

Recommendation for amending the assessment tools used in A&E of SO11 by the GDP assignments: inclusion of e.g., an OBEx-based tool in addition to the technical drawings chapter of the GDP final report

- Recommendation by OCT-11 → 2014-15 Spring
- Remedial Action Decision taken (GDP Coord. Team) → 2015-16 Fall
- Implementation by GDP Coord. Team → 2015-16 Fall
- Re-Assessment → 2015-16 Fall
 - Also Reason12 (SR-13) by the GDP Coord. Team of CEV492/E in their 2015-16 Fall ISA report (Table 7)

RC-6 / Course-specific: CEV492/E Graduation Design Project

Recommendation for amending the assessment tools used in A&E of SO11 by the GDP assignments: strong advice on implementation of the PI-breakdown based assessment approach for all courses mapped to SO11

- Recommendation (initial) by OCT-11 → 2011-12 Spring
- Recommendation (emphasized) by OCT-11 → 2014-15 Spring
- Remedial Action Decision taken (GDP Coord. Team) → 2015-16 Fall
- Implementation by GDP Coord. Team → 2015-16 Spring
- Re-Assessment → 2015-16 Spring
 - Also Reason13 (SR-14) by the GDP Coord. Team of CEV492/E in their 2015-16 Spring ISA report (Table 7)

RC-7* / Course-specific and Curriculum-level: CEV345E Control&Automation in Environ Facilities

Recommendation for changing the semester of the course from 5th to 7th (or 8th) semester: content and level of this course are determined to be more relevant to the students who have already taken some “design”-related courses

- Recommendation by OCT-11, ACC → 2015-16 Spring
- Remedial Action Decision taken (ACC, DCDC, DAB) → 2015-16 Spring and 2016-17 Spring
- Implementation by EED Administration → to be in 2017-18 Fall
- Re-Assessment → depends on implementation schedule*
 - Also SR-1 and SR-2 by the instructor of CEV345E in his 2014-15 and 2015-16 Fall ISA reports (Table 7)

RC-8* / Course-specific and Curriculum-level: RES111 Technical Drawing (CAD)*

Strong recommendation for revision/improvement of the course to meet the needs of the courses with design projects and technical drawing assignments present in the junior- and senior-years of the curriculum: strong advice to collaborate with the instructors of design/technical drawing-including courses to determine their needs and expectations, and to revise and improve the content and level of the formative technical drawing course by including, i.e., examples directly related to environmental engineering systems, devoting more time on computer-aided drawing exercises using, e.g., AutoCAD software, etc. (need to change the semester of the revised course from 1st to upper semesters)

- Recommendation by OCT-11, ACC → 2015-16 Spring
- Remedial Action Decision taken (ACC, DCDC, DAB) → 2015-16 Spring and 2016-17 Spring
- Implementation by EED Administration → to be in 2017-18 Fall
- Re-Assessment → depends on implementation schedule*
 - Also SR-5 and SR-15 by the instructors of CEV328E and GDP Coord. Team of CEV492/E in their 2015-16 Spring ISA reports (Table 7)

***Special Note for RC-7 and RC-8:** Those “Recommendations for Change” both call for “Curriculum-level” revisions. Accordingly, both RC-7 and RC-8 were communicated to the DCDC (2015-16 Spring), where those revision offers were discussed, approved, communicate to the EEUP Administration and then presented to the faculty members in DAB meetings (May 2016, March-April 2017). Related RADs have recently been incorporated to the final-draft of the revised EEUP curriculum, which has been reviewed as a part of the “Continuous Improvement Strategy of ITU” and the related “Curriculum Development and Improvement Process of ITU EEUP for 2017-18” (Nov 2016 - April 2017), and submitted to ODoS for final checks (April 2017). Implementation schedule for RAD-7 and RAD-8 will be determined after approval of the revised EEUP curriculum for 2017-18 by the ITU Senate (before Fall 2017-18).

SO11 / OVERALL ASSESSMENT and EVALUATION REPORT

SO11 A&E REPORT

RC-9 / SO11-Rubric-specific

Incorporating the technological developments into the current rubric, esp. in *PI7 (use of library resources)*, by i.e., (i) either re-phrasing *PI7* and the related performance descriptors so to include use of online resources and libraries, in addition to physical resources, and/or (ii) merging *PI7 (use of library resources)* and *PI1 (finding needed information)* since both PIs are related with reaching to needed information.

- Recommendation by OCT-11 → 2015-16 Spring
- Remedial Action Decision taken (ACC, DCDC, DAB) → to be in 2016-17 Spring
- Implementation by Instructors, OCC, ACC → to be in 2017-18 Fall
- Re-Assessment → to be in 2017-18 Fall

RC-10 / SO11-Rubric-specific

Revision of the rubric by the SO11 Coordination Team (OCT-11) in collaboration with the instructors of the courses mapped to SO11 so to simplify the rubric to provide a better practice tool and thus increase the robustness of the A&E process and improve it.

- Recommendation by OCT-11 → 2015-16 Spring
- Remedial Action Decision taken (ACC, DCDC, DAB) → to be in 2016-17 Spring
- Implementation by Instructors, OCC, ACC → to be in 2017-18 Fall
- Re-Assessment → to be in 2017-18 Fall

Improvement of the rubric designed specifically for SO11 A&E

To improve the rubric used for assessing the level of attainment of SO11 in conjunct with the *needs of and recommendations from the instructors* of the courses mapped to SO11, as well as to meet the *best practice standards of re-structuring an analytic rubric, being;*

- *a simple,*
- *well-designed,*
- *relevant,*
- *valid rubric with*
 - *measurable dimensions related to*
 - *well- and clearly defined PIs of max. 4-5 and*
 - *with one single action verb to*
 - *simplify and*
 - *objectify metrics and assessments*

Several communications and four joint meetings (two in Spring 2016 and two in Spring 2017) were carried out with the instructors/coordinators of the courses mapped to SO11. Collaborative work between the *SO11 Coordination Team (OCT-11)* and the instructors of the courses mapped to SO11 on revising the rubric has been continuing in due course of preparation of this report, yet the minutes of meetings are available already and the revised analytic rubric is expected to be available for discussion, approval and implementation by the end of 2016-2017 Spring Semester.

APPENDIX A

RESOURCES / ASSESSMENT TOOLS

SO11 / OVERALL ASSESSMENT and EVALUATION REPORT	SO11 A&E REPORT
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RESOURCES / ASSESSMENT TOOLS-I

Table A-1. → Details of the compulsory COURSES with a relative contribution level of “[3] → **A&E :Emphasized; Assessed and Evaluated**” and used in A&E of SO11: Course code, course name, CRN (ID numbers) of cohorts, number of enrolled students

Table A-1. Details of Compulsory Courses w/ a Relative Contribution Level of [3] used in SO11 A&E

Review Cycle	Semester	Course Code	Course Title	Cohort (CRN)	No of students
2013-2014	Fall	CEV492	Graduation Design Project	13704	18
	Spring	CEV330	Water Treatment Plant Design	22656	18
		CEV330E	Water Treatment Plant Design	22657	40
		CEV492/E	Graduation Design Project	23988-23990	34
2014-2015	Fall	CEV345E	Control and Automation in Environmental Facilities	11477	60
		CEV427	Environmental Modelling Principles	11480	26
		CEV427E	Environmental Modelling Principles	11481	13
		CEV437	Wastewater Treatment Plant Design	11502	20
		CEV437E	Wastewater Treatment Plant Design	11504	14
		CEV492/E	Graduation Design Project	13842-13844	18
	Spring	CEV328E	Water Supply and Wastewater Disposal	23557	38
		CEV330	Water Treatment Plant Design	23558	43
		CEV330E	Water Treatment Plant Design	23561	28
		CEV492/E	Graduation Design Project	23930-23931	47
2015-2016	Fall	CEV345E	Control and Automation in Environmental Facilities	11283	72
		CEV427	Environmental Modelling Principles	11320	27
		CEV427E	Environmental Modelling Principles	11322	34
		CEV437	Wastewater Treatment Plant Design	11363	32
		CEV437E	Wastewater Treatment Plant Design	11364	23
		CEV492/E	Graduation Design Project	14141-14142	16
	Spring	CEV328E	Water Supply and Wastewater Disposal	20962	44
		CEV330	Water Treatment Plant Design	20968	62
		CEV330E	Water Treatment Plant Design	20969	28
		CEV492/E	Graduation Design Project	25601-25602	37

SO11 / OVERALL ASSESSMENT and EVALUATION REPORT

SO11 A&E REPORT

RESOURCES / ASSESSMENT TOOLS-II

Table A-2. → Details of the relevant SURVEYS used in A&E of SO11: survey name, survey question number, statement, rating range, etc.

Table A-2. Surveys Mapping for SO11 A&E: Details of Relevant Surveys used in SO11 A&E: Review Cycles with Results, Specific Questions and/or Statements

EMPLOYER SURVEY

Available Results → 2015-16 Fall

Question-22. What is the degree of effort that ITU Environmental Engineering Department alumni employees in your company to improve their knowledge?

Question-23. Of the following categories, what is the participation rate of ITU Environmental Engineering Department alumni employees in your company?

More than once a year / Once a year / Once in a couple of years /Never

Education seminar / Certificate program /Professional development courses / Fairs / Conferences / Other

Question-25. Of the following qualifications, please rate the ITU Environmental Engineering Department alumni employees in your company.

“an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice”

SENIOR EXIT SURVEY

Available Results → 2013-14 Fall, 2014-15 Fall & Spring, 2015-16 Fall & Spring

Please rate yourself in achieving (complying with) the following student outcomes using a scale of 1 to 5.

“an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice”

INTERNSHIP EVALUATION FORM (EMPLOYER)

Available Results → 2014-15 and 2015-16

The Student Outcomes of ITU Environmental Engineering Undergraduate Program are given below. Please evaluate the intern student according to the extent he/she is satisfying our student outcomes so that your input can contribute to the improvement of our education

“an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice”

INTERNSHIP EVALUATION FORM (STUDENT)

Available Results → 2014-15 and 2015-16

The Student Outcomes of ITU Environmental Engineering Undergraduate Program are given below. Please evaluate your internship experience according to the extent it helps you in satisfying the student outcomes so that your input can contribute to the improvement of our education

“an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice”



































SO11 / OVERALL ASSESSMENT and EVALUATION REPORT

SO11 A&E REPORT

DATA SOURCES-I

1. COURSES **[70%] share in A&E of SO11**

nts > 2010_ABET > AssessmentDocs > 2013_14_15_16_Outcome11_A&E > ▼

Name	Date modified
 2015216_CEV492E_Spring_GDP_A&EReport_CYG_240816.pdf	08/26/16 08:49
 20112012_Fall_OC11_RubricReport_ALL_150212.docx	04/16/12 10:49
 NINOVA_ABKoK_2016_StudentOutcomes_Assessment_PPP_030216.pptx	03/19/16 08:10
 NINOVA_CI_CEV492E_GraduationProject_A&E Report_2016_270216.pdf	04/10/16 20:30
 NINOVA_CPC_20132014_Fall_CEV492_CRN13704.pdf	03/19/16 11:46
 NINOVA_CPC_20132014_Spring_CEV330_CRN22656.pdf	03/19/16 09:52
 NINOVA_CPC_20132014_Spring_CEV330E_CRN22657.pdf	03/19/16 09:53
 NINOVA_CPC_20132014_Spring_CEV492-492E_CRN23988-23990.pdf	03/19/16 12:18
 NINOVA_CPC_20142015_Fall_CEV345E_CRN11477.pdf	03/19/16 12:55
 NINOVA_CPC_20142015_Fall_CEV427-427E_CRN11480-11481_Extra.pdf	03/19/16 09:37
 NINOVA_CPC_20142015_Fall_CEV427-427E_CRN11480-11481_O11.pdf	04/10/16 21:07
 NINOVA_CPC_20142015_Fall_CEV437_CRN11502_O11.pdf	03/19/16 09:38
 NINOVA_CPC_20142015_Fall_CEV437E_CRN11504_Extra.pdf	03/19/16 09:40
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 NINOVA_CPC_20142015_Spring_CEV330E_CRN23561.pdf	03/19/16 18:55
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 NINOVA_CPC_20152016_Fall_CEV345E_CRN11283.pdf	04/10/16 17:55
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 NINOVA_CPC_20152016_Spring_CEV328E_CRN20962.pdf	08/31/16 13:12
 NINOVA_CPC_20152016_Spring_CEV330_CRN20968.pdf	08/31/16 13:13
 NINOVA_CPC_20152016_Spring_CEV330E_CRN20969.pdf	08/31/16 13:14
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 NINOVA_CPC_Report_Fall_20152016.pdf	04/10/16 15:29
 NINOVA_CPC_Report_Spring_20132014_20142015.pdf	03/19/16 08:39
 NINOVA_CPC_Report_Spring_20152016.pdf	08/31/16 14:19

Data extraction → Assoc. Prof Ebru DULEKGURGEN

Calculations → Assoc. Prof Ebru DULEKGURGEN

DATA SOURCES-II**2. OTHERS (SURVEYS, INTERNSHIP etc.) [30%] share in A&E of SO11****Ders Kaynakları**

Ana Dizin
 Üst Dizin
 Dosya Yükle
 Link Ekle
 Sil
 Klasör Ekle

/Assessment/Surveys/ Yeniden Adlandır

Dosyalar ↓	Boyut ↓	Tarih ↑
<input type="checkbox"/> Internship_Survey_Report_2014-2015.pdf	71 KB	14 Nisan 2017 19:43
<input type="checkbox"/> Internship_Survey_Report_2015-2016.pdf	125 KB	14 Nisan 2017 19:35
<input type="checkbox"/> Senior_Exit_Report_March2017	86 KB	04 Nisan 2017 16:27
<input type="checkbox"/> VETI_SeniorExit_16-17Fall	370 KB	08 Şubat 2017 15:25
<input type="checkbox"/> VETI_Staj_Isveren_2016	332 KB	28 Kasım 2016 11:49
<input type="checkbox"/> VETI_Staj_Ogrenci_2016	320 KB	28 Kasım 2016 11:49
<input type="checkbox"/> SeniorExitSurveyReport_August2016	151 KB	31 Ağustos 2016 19:06
<input type="checkbox"/> VETI_SeniorExit_15-16_Fall	1 MB	31 Ağustos 2016 19:06
<input type="checkbox"/> VETI_SeniorExit_15-16Spring	434 KB	31 Ağustos 2016 19:06
<input type="checkbox"/> PEOs_Students_Needs_Survey_Result	11 KB	06 Mayıs 2016 13:46
<input type="checkbox"/> 2010-2015_Mezunlar_Anket_Excel_Sonuçları	41 KB	11 Nisan 2016 16:39
<input type="checkbox"/> Mezunlar_Anketi_2010_2015	405 KB	05 Nisan 2016 09:49
<input type="checkbox"/> Öğretim_Üyesi_Anket_Sonuçları	496 KB	04 Mart 2016 16:09
<input type="checkbox"/> Öğrenci_Görüşmeleri_Raporu_2016	232 KB	25 Şubat 2016 14:08
<input type="checkbox"/> Mezuniyet_Anketi_Raporu_2015-2016_Güz	21 KB	13 Şubat 2016 17:04
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<input type="checkbox"/> Mezuniyet_Anket_Sonuçları_Ocak_2016	210 KB	04 Şubat 2016 14:32
<input type="checkbox"/> İşveren_Anketi_Ocak_2016	389 KB	04 Şubat 2016 14:29
<input type="checkbox"/> Mezunlar_Anketi_1980_2010	407 KB	04 Şubat 2016 14:27
<input type="checkbox"/> Staj İşveren_2014_2015	314 KB	04 Şubat 2016 14:25
<input type="checkbox"/> Staj Öğrenci_2014_2015	300 KB	04 Şubat 2016 14:25

Data extraction → TA-RA Meltem AĞTAŞ**Calculations** → Assoc. Prof Ebru DULEKGURGEN

DATA and RESULTS from SURVEYS

Others (Surveys, internship etc.): (30% share)

EMPLOYER SURVEY

22. What is the degree of effort that ITU Environmental Engineering Department alumni employees in your company to improve their knowledge?

23. Of the following categories, what is the participation rate of ITU Environmental Engineering Department alumni employees in your company?

More than once a year / Once a year / Once in a couple of years /Never

Education seminar / Certificate program /Professional development courses / Fairs / Conferences / Other

25. Of the following qualifications, please rate the ITU Environmental Engineering Department alumni employees in your company.

An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

RESULTS / 2015-2016 Fall Semester (January 2016)

EMPLOYER SURVEY

2015-2016 / January

Qs 22, 23, 25

**Number of
attendees**

7

outstanding	42%
satisfactory	15%
developing	13%
unsatisfactory	29%
at or above satisfactory	57%

SO11 / OVERALL ASSESSMENT and EVALUATION REPORT

SO11 A&E REPORT

Others (Surveys, internship etc.): (30% share)

SENIOR EXIT SURVEY

Please rate yourself in achieving (complying with) the following student outcomes using a scale of 1 to 5.

An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

	2013-2014	2013-2014	2014-2015	2014-2015	2015-2016	2015-2016		2013-2014	2014-2015	2015-2016
	Fall	Spring	Fall	Spring	Fall	Spring		Academic Year	Academic Year	Academic Year
Outstanding	33%	N.A	15%	14%	21%	22%		33%	14%	22%
Satisfactory	33%	N.A.	8%	34%	36%	44%		33%	28%	42%
Developing	33%	N.A.	69%	41%	36%	28%		33%	48%	30%
Unsatisfactory	-	N.A.	-	-	7%	6%		-		6%
At or Above Satisfactory	66%	N.A.	23%	48%	57%	66%		66%	42%	63%
Number of students answered	6	N.A.	16	49	14	32		6	65	46

SO11 / OVERALL ASSESSMENT and EVALUATION REPORT

SO11 A&E REPORT

Others (Surveys, internship etc.): (30% share)

INTERNSHIP EVALUATION FORM (EMPLOYER)

The Student Outcomes of ITU Environmental Engineering Undergraduate Program are given below. Please evaluate the intern student according to the extent he/she is satisfying our student outcomes so that Your input can contribute to the improvement of our education

	2014-2015	2015-2016
outstanding	78%	72%
satisfactory	21%	23%
developing	2%	1%
unsatisfactory	0%	3%
At or Above Satisfactory	99%	96%
Number of attendees	125	134

Others (Surveys, internship etc.): (30% share)

INTERNSHIP EVALUATION FORM (STUDENT)

The Student Outcomes of ITU Environmental Engineering Undergraduate Program are given below. Please evaluate your internship experience according to the extent it helps you in satisfying the student outcomes so that Your input can contribute to the improvement of our education

	2014-2015	2015-2016
outstanding	49%	55%
satisfactory	33%	32%
developing	14%	11%
unsatisfactory	4%	3%
At or Above Satisfactory	82%	86%
Number of attendees	134	132

ITU, Environmental Engineering Undergraduate Program
2011-2012 Fall Semester

APPENDIX B

Initial (2011-2012) ASSESSMENT REPORT

for

OUTCOME11

***“AN ABILITY TO USE THE TECHNIQUES, SKILLS, AND MODERN ENGINEERING TOOLS NECESSARY
FOR ENVIRONMENTAL ENGINEERING PRACTICES”***

Assigned LECTURES

CEV411 Wastewater Treatment
CEV441 Environmental Modeling Principles
CEV492 Graduation Design Project

Overall Evaluators

Assist. Prof Ebru DÜLEKGÜRGEN
Res Assist Edip AVŞAR

April 2012

*Available on-line at the publically accessible official web-site of ITU-EED; URL:
[http://www.cevre.itu.edu.tr/docs/librariesprovider127/default-document-library/outcome-11--an-ability-to-use-the-techniques-skills-and-modern-engineering-tools-required-for-environmental-engineering-practices-\(2011-2012\).pdf?sfvrsn=0](http://www.cevre.itu.edu.tr/docs/librariesprovider127/default-document-library/outcome-11--an-ability-to-use-the-techniques-skills-and-modern-engineering-tools-required-for-environmental-engineering-practices-(2011-2012).pdf?sfvrsn=0)*

OUTCOME11	RUBRIC Applications / ASSESSMENT
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SYNOPSIS-B

ITU Undergraduate Program / Fall 2011-2012

Overall RUBRIC Results for OUTCOME 11 (Level 3): Individual CLASS performances FROM 3 Assigned Courses

Table B3

	<i>NOT APPLICABLE</i>	<i>Table B3</i>	<i>NOT AVAILABLE</i>	<i>(based only on CEV441)</i>
	<i>CEV411</i>	<i>CEV441</i>	<i>CEV496</i>	<i>OVERALL</i>
<i>PERFORMANCE LEVELS</i>	<i>CLASS PERFORMANCE</i>	<i>CLASS PERFORMANCE</i>	<i>CLASS PERFORMANCE</i>	<i>CLASS PERFORMANCE</i>
<i>OUTSTANDING</i>		9%		9%
<i>SATISFACTORY</i>		82%		82%
<i>DEVELOPING</i>		9%		9%
<i>UNSATISFACTORY</i>		0%		0%

<i>OUTSTANDING</i>	x/80	5/55	?	5/55
<i>SATISFACTORY</i>	x/80	45/55	?	45/55
<i>DEVELOPING</i>	x/80	5/55	?	5/55
<i>UNSATISFACTORY</i>	x/80	0/55	?	0/55

OUTCOME11	RUBRIC Applications / ASSESSMENT
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2. OUTCOME OVERALL EVALUATORS.....	3
3. ASSIGNED COURSES (for Fall 2011-2012).....	3
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b) <i>CEV441 Environmental Modeling Principles.....</i>	<i>5-6</i>
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OUTCOME11	RUBRIC Applications / ASSESSMENT
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1. OUTCOME NUMBER and CONTENT

RELATION OF THE COURSE CONTENT IN ACHIEVING PROGRAM OUTCOMES

Contribution Level: 3

OUTCOME 11

An ability to use the techniques, skills, and modern engineering tools necessary for environmental engineering practices

2. OUTCOME OVERALL EVALUATORS

Assist. Prof. Ebru DÜLEKGÜRGEN

Res. Assist. Edip AVŞAR

3. ASSIGNED COURSES (for Fall 2011-2012)

CEV411 Wastewater Treatment

CEV441 Environmental Modeling Principles

CEV492 Graduation Design Project

4. RUBRIC for OUTCOME11 (ITU EED)

See Table B1 for the rubric for assessment of realization of Outcome11.

OUTCOME11	RUBRIC Applications / ASSESSMENT
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Table B1. Rubric for Outcome 11 (ITU EED)

OUTCOME-11	An ability to use the techniques, skills, and modern engineering tools necessary for environmental engineering practices			
Performance Criteria [weigh]	Unsatisfactory 1 point	Developing 2 points	Satisfactory 3 points	Outstanding 4 points
Finding needed information/outside resources [1]	Often does not even use the course textbook to help solve problems or homework	Looks only to class resources in solving problems and homework	Seeks information on problems from limited resources	Seeks information on problems from multiple resources
Interpreting needed information/outside resources [2]	Is not willing to use outside resources unless required	Requires assistance in interpretation of information from a small number of outside resources	Is able to interpret and understand information from limited number of outside resources	Is able to interpret and understand information from a variety of resources
Selecting/using tools [2]	Is not able to identify and/or use the right tools for a particular problem or project	Needs some guidance in selecting and/or using appropriate tools for a particular problem or project	Can usually identify and/or use tools that might fit a particular problem or project	Can identify and/or use appropriate tools effectively in assignments or projects
Computer skills [1]	Struggles with simple tasks in PC use and/or is unable to use current software packages	Can perform simple tasks requiring PC use and /or use of current software packages	Can perform necessary tasks requiring PC use and /or use of current software packages	Maintains current, state-of-the-art abilities in PC use and use of current software package
Using specialized engineering tools, such as simulations, graphical techniques, etc. [2]	Uses in assignments or classroom work when guided by the instructor	Uses in assignments or classroom work without help of the instructor	Uses in design projects where the professor chooses, restricts, or helps in the selection of the tools. Students analyze and validate the results.	Uses in design projects where students make an appropriate choice of the tool. Students analyze and validate the results.
Using other modern tools and instruments for Environ Engineering applications [1]	Can not use other modern tools and instruments for Environmental Engineering	Poor or improper use of other modern tools and instruments for Environmental Engineering	Satisfactory use of other modern tools and instruments for Environmental Engineering	Extensive use of other modern tools and instruments for Environmental Engineering
Using library resources [1]	Does not use the library	Requires assistance in locating materials from the library	Understand the use of the library	Understand the organization and use of the library
OVERALL PERFORMANCE	Unsatisfactory	Developing	Satisfactory	Outstanding
POINTS REQUIRED	0-10	11-20	21-30	31-40

OUTCOME11	RUBRIC Applications / ASSESSMENT
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5. ASSESSMENTS / SUGGESTIONS for IMPROVEMENT

a) CEV411 Wastewater Treatment

This 7th semester course is one of the courses of the ITU Environmental Engineering Undergraduate Program (EEUP) assigned for overall assessment of realization of Outcome11 at a contribution level of 3 for Fall 2011-2012.

This course has 2 sessions in Turkish: one with 49 students and given by Prof İzzet ÖZTÜRK and Assoc. Prof H. Güçlü İNSEL (Session-1) and the other with 31 students and given by Prof. İsmail KOYUNCU and Assist Prof Mahmut ALTINBAŞ (Session-2).

According to the original assessment documents prepared by those instructors and submitted to the evaluation team, the **rubric for Outcome11** seen in Table 1 was **not applied** for assessment of realization of outcome11 at a level of 3 (see original documents in Appendix). Instead, **assessment** of students' performances was **limited to** grading their abilities/performances in 5 different **drawing assignments** within the scope of the project assignment run throughout the semester. This assessment is **related only to the 5th performance criterion (PC) of the rubric** for Outcome 11 (Table 1): "**using specialized engineering tools, such as simulations, graphical techniques, etc.**"

Details of those partial assessments can be found in the Appendix. According to those original assignments based only on drawing skills of the students and related only to the 5th PC of the rubric the performance summaries for the 2 sessions are as follows:

Table B2. Partial assessment for PC-5 of Outcome11 by the 2 sessions of CEV411

	Session-1		Session-2		CEV411 All Sessions	
PERFORMANCE LEVELS	Number of students	CLASS PERFORMANCE	Number of students	CLASS PERFORMANCE	Number of students	CLASS PERFORMANCE
OUTSTANDING	0/49	0%	0/31	0%	0/80	0%
SATISFACTORY	31/49	63%	21/31	68%	52/80	65%
DEVELOPING	18/49	37%	10/31	32%	28/80	35%
UNSATISFACTORY	0/49	0%	0/31	0%	0/80	0%

Suggestion for Improvement:

For the next semester, it is recommended by the evaluation team that the **entire rubric be applied** with evaluation of the **all 7 performance criteria** for a more comprehensive assessment of realization of Outcome11 by this course.

b) CEV441 Environmental Modeling Principles

This 7th semester course is one of the courses of the ITU (EEUP) assigned for overall assessment of realization of Outcome11 at a contribution level of 3 for Fall 2011-2012.

This course has 2 sessions: one in Turkish (25 students), one in English (30 students). Assessment reports for those sessions were submitted to the evaluator team by Assist Prof Ali ERTÜRK.

According to the original assessment documents prepared by those instructors and submitted to the evaluator team, the **rubric for Outcome11** seen in Table 1 was **applied** for assessment of realization of Outcome11 at a level of 3 (see original documents in Appendix). The **assessment tool** was a "**team-work**" assignment where the students were expected to **use a water quality modeling software** (developed by one of the instructors of the course) that is claimed to have similar capabilities

OUTCOME11	RUBRIC Applications / ASSESSMENT
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and limitations to a real-world environmental modeling on a PC and to **seek information** on how to run the model and **interpret the results**, together with preparation of a **report** and making an **oral presentation**. Summary of the results of this assessment is given in Table 3.

Table B3. Rubric-based assessment for realization of Outcome11 by the 2 sessions of CEV441

	Session-1		Session-2		CEV441 All Sessions	
PERFORMANCE LEVELS	Number of students	CLASS PERFORMANCE	Number of students	CLASS PERFORMANCE	Number of students	CLASS PERFORMANCE
OUTSTANDING	5/25	20%	0/30	0%	5/55	9%
SATISFACTORY	20/25	80%	25/30	83%	45/55	82%
DEVELOPING	0/25	0%	5/30	17%	5/55	9%
UNSATISFACTORY	0/25	0%	0/30	0%	0/55	0%

Suggestion for Improvement:

The evaluator team recommends that the assessment continues as is for the next semester.

c) CEV492 Graduation Design Project

This 7th semester course is one of the courses of the ITU Environmental Engineering Undergraduate Program assigned for overall assessment of realization of Outcome11 at a contribution level of 3 for Fall 2011-2012.

This course has several sessions (team works, coordinated by various instructors), all in Turkish.

According to the original assessment report prepared by the instructors and submitted to the evaluation team, the **rubric for Outcome11** seen in Table 1 was **not applied** for assessment of realization of Outcome11 at a level of 3 (see original documents in Appendix). At the original assessment report, it was stated by the instructors that computer aided design was used as a modern engineering tool for drawing assignments of the graduation design project and the rubric did not have a separate criterion for assessing the quality of the drawings, hence it was not possible to assess the realization of Outcome11 for Fall 2011-2012 by this course. The instructors also stated that the rubric would be revised for the next semester to assess the skills of the students to use computer aided design.

Suggestion for Improvement:

For the next semester, it is suggested by the evaluation team that it might be a **starting point to apply the current rubric** with evaluation of **all 7 performance criteria** for assessment of realization of Outcome11 by this course.

Note: in due course of preparation of this assessment report, the evaluator team asked the instructors of this course (via e-mail) about their ideas/suggestions for improving the rubric for Outcome11. No improvement suggestion has arrived to the evaluator team regarding this issue as of the due date of this report (15.04.12), yet it was stated via e-mail that preparation of a new rubric or revision of the current rubric will be carried out throughout the Spring Semester of 2011-2012 all together by the instructors of this course and will be applied by the end of that semester.

6. SUMMARY of EVALUATION RESULTS

Please see “**Synopsis**” for the summary.