

# Developing Transfer Engineering Diploma Programs for Community College Students: KAAU Experience

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## Abstract

This paper presents handful transfer engineering diploma programs for community college students. These programs are tailored to industry requirement while giving the chance for excellent students to transfer to engineering colleges to get a bachelor of science degree. The transfer is made to any local engineering college with minimum loss in the transfer credits.

## Key Words

Engineering, Education, Transfer, Diploma, Program

## 1. Introduction

Communities colleges are somehow new to the educational environment in Saudi Arabia and the whole Arab World at large, but world-wide it has been in business for more than a century. The fast spread of these colleges in the Arab world specially in the Arabian Gulf area is attributed to so many causes including the high birth rate (up to 4% per year), the difficulties to restructure the existing universities, the theoretical abstracted aspect of the existing universities programs, the influence of the industrialized societies-driven in the current educational programs that does not meet the demand of the developing countries like most of the Arab world and the high unemployment rate.

However, the start of these community colleges is not up to the expectation due to some social and cultural adaptively challenges including the feeling of lower academic degree, the search for office type of job and titles. The current programs offered in 13 new community colleges aim to fit industry requirement in terms of specialty and subjects to teach. As a result of all of these factors top high school graduates do not join community colleges for the above reasons.

Jeddah Community College (JCC), one of King Abdulaziz University Faculties in Jeddah, Saudi Arabia, takes the initiative of developing Engineering Transfer Diploma Programs (ETDP). These programs are presented here in short format.

## 2. Design of the Programs

It has been observed that most of the Engineering Transfer Diploma Programs (ETDP) are made by cut of the first two-years courses from engineering bachelor degree and paste these courses as the diploma program. That methodology is biased toward the engineering colleges because it prepares good students to transfer to engineering college at the cost of average students who would join the industry after getting the diploma certificate. By doing this cut-and-paste mechanism, the graduate has no choice other than to transfer to engineering programs. Because students studied few courses in math, physics and chemistry. Thus it was necessary to develop ETDP that solve this issue using an innovative way.

The work started by consulting engineering professors to develop these program. Team of professors from three top Saudi universities in five engineering subjects were formed to develop these programs. These universities and programs are given in Tables 1 and 2 respectively. This goal of this team is to develop these programs having in mind the followings:

1. Saudi engineering schools have been offering undergraduate and graduate programs for decades.
2. These schools have excellent curriculum with excellent staff members graduate from top international universities like Berkeley, Stanford, UMIST, and so on.
3. Program at these schools have been accredited by international organizations like ABET [1].
4. The academicians would look at the big picture when designing these programs without being biased to any sub area in the program.
5. They will help in maximizing the transfer credits and minimizing the loss credits when student wants to continue his bachelor degree.

Table 1: Participated Universities.

No	University	Abbreviation
1	King Abdulaziz University	KAU
2	King Saud University	KSU
3	King Fahad University for Petroleum and Minerals	KFUPM

Table 2: Developed Programs.

No	Program	Abbreviation
1	Mechanical Engineering	ME
2	Civil Engineering	CE
3	Chemical Engineering	CHE
4	Industrial Engineering	IE
5	Electrical Engineering	EE

These programs were reviewed by panelist of practitioners in different areas. These were engineering professional with associate degree or bachelor degree. Their input in

terms of modification, adjusting of these programs is needed. Input of these professionals is a must, keeping in mind the following points:

1. These programs are developed to satisfy the local industry needs and requirements, thus their professional input is a must.
2. They know exactly the type of job the graduate of this diploma will carry on and thus they can specify tasks and duties needed for that job.
3. Their presence build some sort of loyalty to the JCC by developing programs based on input from local engineering-operated firms.

In addition to all of the above team work, experience of other community colleges in developing transfer diploma programs are used. See for example [2-10].

The objective of this work can be summarized as follow:

1. To educate assistant engineers and give them the necessary skills and knowledge to work in local industry.
2. To facilitate easy transfer of good students to engineering programs in order to continue their education toward the bachelor degree.
3. To minimize the loss of credit hours when transferring from community colleges to engineering colleges.
4. To build good and reliable image for the community colleges and thus attracting brilliant students to these colleges.
5. To develop diploma programs tailed to the local need of the industry

### **3. The Developed Programs**

Five diploma programs were developed as listed in Table 2. These programs are shown in Tables 3-7. Courses proposed in these programs were compared to courses being offered in local Saudi universities shown in Table 1 in addition to King Khalid University (KKU), Kuwait University (KU) and Umm Alquraa University (UQU). Developed ETDP have some common ground including:

1. The approximate number of credit hours is 64 cr. Hrs
2. The total number of courses is not constant and vary from 18 to 21 course per program.
3. These programs give proposed course title and course number
4. Prerequisites are given when needed
5. The proposed credit hours are given in the table
6. The credit hours of equivalent courses if found in engineering colleges of local universities
7. Theses tables add up the total number of credits hrs of these equivalent courses.

The work in this project [11] includes details of these programs like course descriptions, course outline and program flow chart.

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**Table 3: Electrical Engineering Diploma Program.**

ELECTRICAL ENGINEERING										
Course Title	Course No.	Pre-requisites	Credit Hours	KAUU	KSU	KFUPM	UQU	KHU		
Mathematics I*	MATH101		4	4	3	4	4	N		
Mathematics II*	MATH102	MATH101	4	4	3	4	4	O		
Mathematics III	MATH203	MATH102	4	4	3	3	3			
Mathematics IV	MATH204	MATH102	3	3	3	3	3	S		
PHYSICS I*	PHYS101		4	4	4	4	4	U		
PHYSICS II	PHYS102	PHYS101	4	4	4	4	4	C		
Computer Programming I	EE201	MATH101	3	3	2	3	3	H		
Computer Programming II	EE202	EE201	3	3	3	3	3			
Basic Electrical Engineering	EE250	PHYS102	4	4	3	3	4	D		
Engineering Methods	EE300	MATH203	3	3	3	3	*	E		
Electrical Circuits & Systems	EE301	MATH204,EE250,EE300	3	3	3	3	3	P		
Electromagnetic	EE302	MATH203,EE250	3	3	3	4	3	A		
Electronics I	EE311	EE250	4	4	4	4	4	R		
Communications	EE321	EE301	4	4	3	4	3	T		
Control	EE331	EE300,EE301	4	4	3	4	4	E		
Electrical Machines I	EE341	EE250	4	4	3	4	4	M		
Power Systems I	EE351	EE250	4	4	*	4	3	E		
Project	EE399		2					N		
TOTAL CREDIT HOURS				64	62	50	61	56	0	

\*Common Courses

**Table 4: Industrial Engineering Diploma Program.**

INDUSTRIAL ENGINEERING										
Course Title	Course No.	Pre-requisites	Credit Hours	KAU	KSU	KFUPM	UQU	CU	KAU	KU
Mathematics I*	MATH 101		4	4	3	4	N			*
Mathematics II*	MATH 102	MATH 101	4	4	3	4	O			*
Differential Eqns.	MATH 103	MATH102	3	3	3	*				*
Physics I*	PHYS 101	MATH 101	4	4	4	4	S			*
Engg Drawings	ME 101		3	3	3	*	U			*
Engg Statics	ME 102	ME101	3	2	3	3	C			*
Engg Dynamics	ME 201	ME 102	3	3	3	3	H			3
Computer Engg.	EE 201	MATH 101	3	4	3	4				*
Technical Writing	IE 201		2	2	*	*	D			*
Learning Skills	IE 202	IE-201	3	3	*	*	E			*
Engg. Economy	IE-203		2	2	3	*	P			*
Engg. Management	IE-204	IE-202	2	2	2	2	A			3
Engg. Prob. & Stat.	IE 301	MATH 102	3	3	3	3	R			3
Operations Research	IE-311	MATH 103	3	3	**	3	T			3
Computer Applications	IE 321	EE-201	3	3	2	3	E			3
Work Measur & H. Fact	IE 331	IE-202	3	4	3	3	M			3
System Analy & Design	IE 341	IE-202	3	3	3	3	E			3
Manag. Info. System	IE-411	IE-321	3	3	3	3	N			3
Quality & Productivity	IE 412	IE-311	3	3	3	3	T			3
Safety & Hygiene	IE-413	IE-331	3	4	3	3				3
Prod, Plnng & Cntrl	IE-414	IE-311	3	3	3	3				3
Facility Planning	IE-415	ME-101	3	3	3	3				3
Total Credits			66	68	56	54	0			36

Table 5: Civil Engineering Diploma Program.

CIVIL ENGINEERING										
Course Title	Course No.	Pre-requisites	Credit Hours	KAUU	KSU	UQU	KFUPM	KKU		
Math I*	MATH 101		4	4	3	N	4	N		
Physics I*	PHYS 101	MATH 101	4	4	4	O	4	O		
Math II*	MATH 102	MATH 101	4	4	3		4			
Statistics	STAT 101	MATH 101	3	3	3	S	3	E		
Statics	ME 102	PHYS 101	2	2	3	C	3	D		
Dynamics	ME 201	ME 102	3	3	3	H	3	E		
Fluid Mechanics	ME 290	PHYS 101	4	4	3		3	P		
Strength of Materials	CE 270	ME 102	4	4	2	D	3	A		
Graphics (AutoCAD)	ME 101		3	2	3	E	3	R		
Computer Programming	EE 201		3	4	3	P	4	T		
Hydraulic Engineering	CE 341	ME 290	4	4	4	A	3	M		
Concrete Technology	CE 321	CE 270	3	4	2	R	4	E		
Structural Analysis	CE 330	CE 270	4	3	3	T	3	N		
Reinforced Concrete Design	CE 333	CE 330	3	4	3	E	3	T		
Geotechnical Engineering	CE 324	CE 270	4	4	2	M	4			
Surveying	CE311	MATH 102	3	3	2	E	3			
Transportation Engineering	CE 351	CE 311	3	3	3	N	3			
CE Drawings	CE 370	ME 101	3	2	2	T	3			
Construction Engineering	CE 377	ENGG 201	3	4	3		4			
Total Cr. Hrs.			66	65	54	0	64	0		0

**Table 6: Mechanical Engineering Diploma Program.**

MECHANICAL ENGINEERING									
Course Title	Course No.	Pre-requisites	Credit Hours	KAAU	KSU	UQU	KFUPM	KKU	
Math I*	MATH 101		4	4	3	4	4	U	
Physics I*	PHYS 101	MATH 101	4	4	4	4	4	N	
Math II*	MATH 102	MATH 101	4	4	3	4	4	D	
Statistics	STAT 101	MATH 101	3	3	3	3		E	
Statics	ME 102	PHYS 101	2	2	3	3	3	R	
Dynamics	ME 201	ME 102	3	3	3	3	3		
Fluid Mechanics	ME 290	PHYS 101	3	4	3	4	3	C	
Strength of Materials	CE 270	ME 102	3	4	3	3	3	O	
Graphics (AutoCAD)	ME 101		3	3	3	2	3	N	
Thermodynamics	ME 261	PHYS 101	3	4	3	3	3	S	
Basic Workshop	ME 130	ME 101	3	2	2	2		T	
Material Science	CHM 210	PHYS 101	3	4	3	2	3	R	
Machine Elements Design	ME 310	CE 270	3	3	3	3	3	U	
Manufacturing Technology	ME 332	ME 130	3	3	3	3	4	C	
Heat Transfer	ME 360	ME 290	3	4	3	4	3	T	
Air Conditioning	ME 364	ME 360, ME 261	3	3		3	3	I	
Machine Design	ME 355	ME 310	3	3	3	3	4	O	
Computer Aided Design	ME 370	ME 355	3	3	3			N	
Mechanical Vibrations	ME 380	ME 201	3	3	3	4			
Quality Control	ME 390	ME 332	3	3	3	3			
Engineering Management	IE 201		2	2		2			
Total Cr. Hrs.			64	68	54	62	50	0	