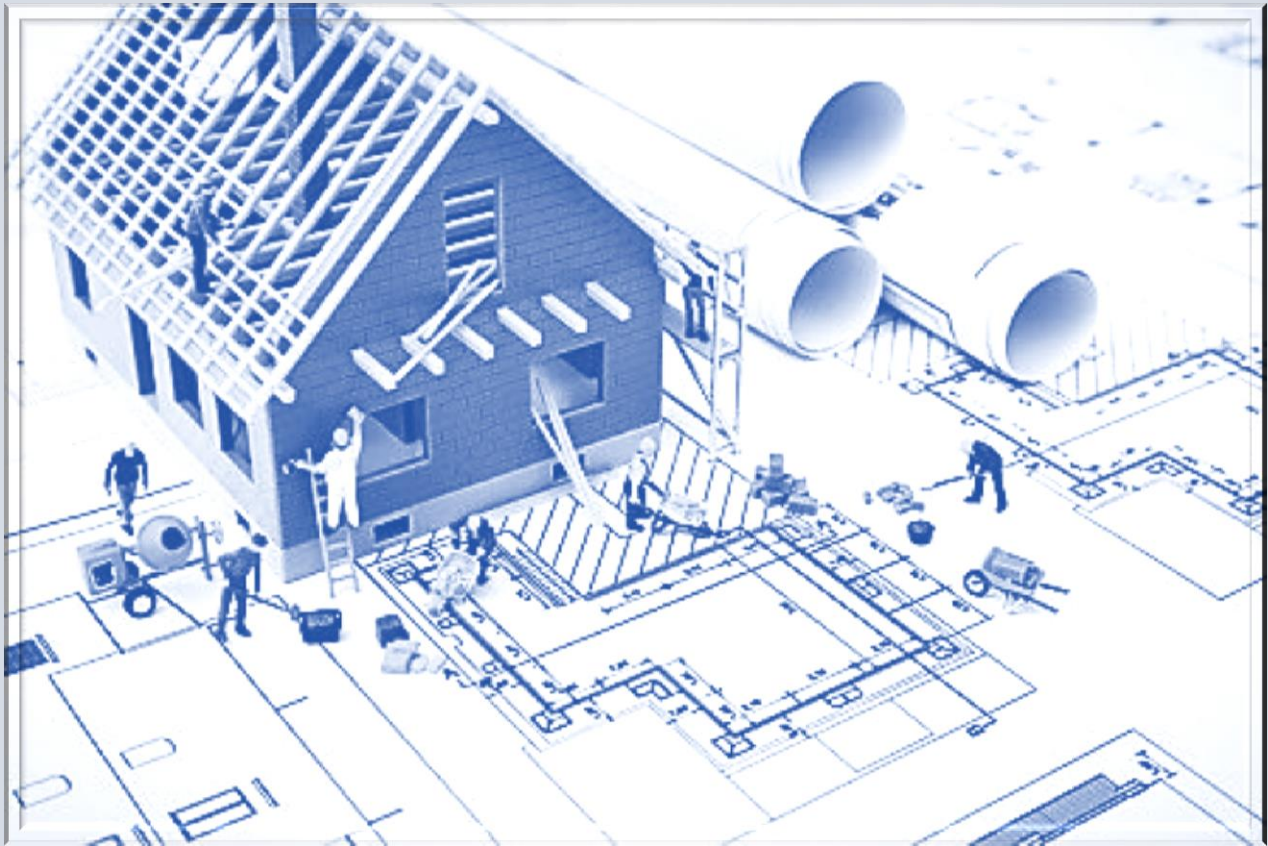




Construction Engineering and Management Program



B.Sc. Program Specification

Bylaw 2023 according to NARS2018

Benha University – Benha Faculty of Engineering

2023-2024

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A- General

1. Basic Information

Program Title	Construction Engineering and Management
Program Type	<input checked="" type="checkbox"/> Single <input type="checkbox"/> Double <input type="checkbox"/> Multiple
Department responsible of program	Civil Engineering Architecture Engineering
Program Coordinator	Dr. Ahmed Youssef Kamal El-Deen
Quality Coordinator	Dr. Rasha Mohey Al-Deen
Program URL	https://beng.bu.edu.eg/depts/new-programs/construction-engineering-and-management-program

B- Professional Information

1. Program Mission

The Benha faculty of Engineering Construction Engineering and Management program aims to develop the skills and knowledge students need to successfully complete construction projects on time and on budget while adhering to construction standards and safety guidelines within human values and social responsibility. Graduates will have sufficient knowledge and skills to develop their postgraduate research skills and find a local or international employment in the commercial, design-build, and residential sectors of the construction industry.

2. Program Objectives (PO)

The objectives of the BSc in The Construction Engineering and Management program are to enable its graduates to:

PO1. Apply a wide spectrum of engineering knowledge, science, and specialized skills with analytic, critical, and systemic thinking to identify and solve engineering problems in real-life situations.

PO2. Behave professionally, adhere to engineering ethics and standards, and work to develop the profession and community and promote sustainability principles.

PO3. Work in and lead a heterogeneous team and display leadership qualities, business administration, and entrepreneurial skills.

PO4. Master self-learning and life-long learning strategies to communicate effectively in academic/professional fields.

PO5. Apply analytical, experimental, design, construction engineering techniques and project management skills with proficiency aided by modern tools.

PO6. Graduate a postgraduate student who has the necessary scientific knowledge and innovative thinking needed for the Construction engineering and management engineering field.

3. Graduates Attributes (GA)

By the completion of the Construction Engineering and Management program of study, and according to NARS 2018, the graduate will be capable to:

- 1.** Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real-life situations.
- 2.** Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.
- 3.** Behave professionally and adhere to engineering ethics and standards.
- 4.** Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
- 5.** Recognize his/her role in promoting the engineering field and contribute to the development of the profession and the community.
- 6.** Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
- 7.** Use techniques, skills, and modern engineering tools necessary for engineering practice.
- 8.** Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post-graduate and research studies.
- 9.** Communicate effectively using different modes, tools, and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
- 10.** Demonstrate leadership qualities, business administration, and entrepreneurial skills.

In addition to all engineering graduate attributes defined by NARS 2018, Construction and Management engineering graduates should be able to:

- 11.** Identify the essential construction processes technologies techniques, Properties, behavior & fabrication of construction materials.
- 12.** Master Projects management, including planning, finance, bidding, contract procedures, cost estimators, and quality systems.
- 13.** Use the different analytical and computational methods that can be applied to the various areas of construction and building engineering.

4. Student Competencies (SC)

The program courses fulfill the **NARS 2018**

In addition to the competencies for all Engineering Programs (**A-Level**), the Construction Engineering and Management Program graduate must be able to (**B-Level**)and (**D-Level**):

Level A: The engineering graduate must be able to:

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

A2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

A3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

A5. Practice research techniques and methods of investigation as an inherent part of learning.

A6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

A7. Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.

A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

A9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

A10. Acquire and apply new knowledge, and practice self, lifelong and other learning strategies.

Level B: The engineering graduate must be able to:

B1: Select appropriate and sustainable technologies for the construction of buildings, infrastructures, and water structures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and Strength of Materials, Surveying, Soil Mechanics, Hydrology and Fluid Mechanics.

B2: Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures; and at least three of the following civil engineering topics: Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Irrigation, Water Resources and Harbors; or any other emerging field relevant to the discipline.

B3: Plan and manage construction processes; address construction defects, instability and quality issues; maintain safety measures in construction and materials; and assess environmental impacts of projects.

B4: Deal with biddings, contracts and financial issues including project insurance and guarantees.

Level D: The engineering graduate must be able to:

D1: Create architectural, urban, and planning designs that satisfy both aesthetic and technical requirements, using adequate knowledge of history and theory, related fine arts, local culture and heritage, technologies, and human sciences

D2: Generate ecologically responsible, environmental conservation and rehabilitation designs; through an understanding of structural design, construction, technology, and engineering problems

5. Program Academic Standards

-Academic reference Standards of Construction Engineering and Management program approved by faculty council in **12/11/2019 No. 385**

6. Reference standards

- National Academic Reference Standards of (NARS) 2018 which were issued by the National Authority for Quality Assurance & Accreditation of Education NAQAAE.

7. Program Structure and Contents

7.1 Program Duration: (9 semesters)

7.2 Program Structure:

Total hours of the program:-	160 hours
Theoretical:-	111 hours
Practical/Exercises:-	121 hours
Compulsory:-	87 hours
Elective Course:-	18 hours
Humanity – Elective :-	6 hours
Selective:-	none

7.3 Program Courses VS Requirements

7.3.1 List of Compulsory Courses

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Requirements			
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirements
Level 0	FRB001	Analytical geometry & Linear Algebra	.....	3	2	0	2	4		3		
	FRB003	Statics	.....	3	2	0	2	4		3		
	FRB005	Waves and Heat	.....	3	2	2	1	5		3		
	FRB007	Chemistry for Engineers	.....	4	3	2	1	6		4		
	FRM009	Engineering Graphics	.....	2	0	0	4	4		2		
	UHS101	Foreign Language	.....	2	2	0	0	2	2			
	UHS103	Social issues	.....	2	2	0	0	2	2			
	FFB002	Integration & Multivariable functions	FRB001	3	2	0	2	4		3		
	FRB004	Dynamics	FRB003	3	2	0	2	4		3		
	FRB006	Electricity and Magnetism	.....	3	2	2	1	5		3		
	FRM008	Production Systems Engineering	.....	2	1	3	0	4		2		
	FRM010	Computer Aided Drafting	FRM009	2	1	2	0	3		2		
2nd Level	FRB101	Engineering Differential Equations	FRB002	3	2	0	2	4			3	
	CMC101	Structural Analysis-1	FRB003	3	2	0	2	4			3	
	CMC103	Properties and Testing of Construction Materials	FRB003	2	2	1	0	3			2	
	FRB103	Environmental Pollution and Industrial Safety	FRB007	2	2	1	0	3		2		
	CMC105	Surveying for Engineers-1	FRB002	3	2	2	1	5			3	
	CMA107	Basic Architectural Engineering	FRM009	2	1	0	2	3			2	
	CMC109	Fluid Mechanics	FRB005	2	2	1	0	3			2	
	FRB102	Water Chemistry	FRB007	3	2	2	0	4			3	
	CMC102	Structural Analysis- 2	CMC101	3	2	0	2	4			3	
	CMC104	Construction Materials and Concrete Technology	CMC103	3	2	2	1	5			3	

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Requirements			
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirements
	CMC106	Construction Engineers Drawing	FRM010	2	1	3	0	4			2	
	CMC108	Surveying for engineers 2	CMC105	3	2	0	2	4			3	
	CMA110	Building Construction	CMA107	2	2	0	1	3				2
	CMC112	Hydraulics for Construction	CMC109	2	2	1	0	3			2	
3rd Level	FRB201	Applied Engineering Probability and Mathematical Statistics	.....	3	2	2	0	4			3	
	CMC201	Hydrology and Water Resources	CMC112	3	2	0	2	4			3	
	CMC203	Soil Mechanics	CMC103	3	2	2	1	5			3	
	CMC205	Design of Metallic Structures -1	CMC102	3	2	0	2	4			3	
	CMC207	Design of R.C. Structures -1	CMC102 + CMC104	3	2	0	2	4			3	
	UHS XXX	Humanities Elective I	.....	2	2	0	0	2	2			
	FRB104	Engineering Numerical Analysis	FRB101	3	2	2	0	4			3	
	CMC202	Transportation and Traffic Engineering	FRB201	3	2	1	2	5			3	
	CMC204	Geotechnical Engineering & Foundations	CMC203	3	2	2	1	5			3	
	CMC206	Construction Project Management	.....	3	2	0	2	4			3	
	CMC208	Design of R.C. Structures -2	CMC207	3	2	0	2	4			3	
CMA210	Introduction to City Planning	.....	2	2	0	1	3				2	
4th Level	CMM301	Technical Installations in Buildings	.....	2	1	3	0	4				2
	CMC303	Methods and Equipment for Construction	CMC207	3	2	0	2	4			3	
	CMC305	Design and Construction of Foundations & Earth Retaining Structures	CMC204	3	2	0	2	4			3	
	CMC307	Cost Engineering & Quantity Surveying	CMC206	3	2	0	2	4				3
	CMC 3XX	Elective I	*	3	2	0	2	4				3

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Requirements				
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirements	
	CMC309	Quality Control & Inspection of Structures	CMC207	2	2	0	1	3				2	
	UHS XXX	Humanities Elective II	.....	2	2	0	0	2	2			
	CMC 302	Sanitary Engineering	CMC112	3	2	2	1	5			3		
	CMC 304	Construction and Site Safety	CMC303	2	2	0	1	3			2		
	CMC 3XX	Elective II	*	3	2	0	2	4				3	
	CMC 306	Project Planning, Scheduling, and Control	CMC206	3	2	1	2	5				3	
	CMC 3XX	Elective III	*	3	2	0	2	4				3	
	UHS 104	Professional Ethics	.....	2	2	0	0	2	2			
	CMC 308	Senior Design Project I	**	2	0	4	0	4				2	
h	Le	CMC 401	Project Finance & Management	CMC307	3	2	1	2	5				3
		CMC 4XX	Elective IV	*	3	2	0	2	4				3
		CMC 4XX	Elective V	*	3	2	0	2	4				3
		CMC 403	Construction Project Specifications, Bids, and Contracts	CMC307	2	2	0	1	3				2
		CMC 4XX	Elective VI	*	3	2	2	0	4				3
		CMC 405	Senior Design Project II	CMC308	3	1	4	0	5				3
		UHS XXX	Humanities Elective III	2	2	0	0	2	2			
F		FT 1	Field Training I	***									
T		FT 2	Field Training II	****									
Total hours of five Levels									14	44	57	45	
% Hours of five Levels									8.75	27.5	35.625	28.125	
Reference Ratio									min 8%	min 20%	min35%	max30%	

** The student can register for the Senior Design Project course after passing 70% of the program cr. hr., 112 hr,

*** Completion of 65 Credit Hours

****Completion of 96 Credit Hours

7.3.2 List of Elective Courses

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Requirements				
	Code	Course Title		Cr.Hrs	Lect.	Lab.	Tut.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirements	
Elective Course-1	Fifth	CMA311	Building Technology	....	3	2	0	2	4				3
		CMC313	Highway Facilities	CMC202	3	2	0	2	4				3
		CMC315	Bridge Building Technology	CMC208	3	2	0	2	4				3
Elective Course-2	Fifth	CMC310	Value Engineering in the Construction Industry	....	3	2	0	2	4				3
		CMC312	Engineering Economy	....	3	2	0	2	4				3
		CMC314	Construction Quality Management	....	3	2	0	2	4				3
Elective Course-3	Fifth	CMC316	Dynamic of Structures	CMC102	3	2	0	2	4				3
		CMC318	Design of Metallic Structures-2	CMC205	3	2	0	2	4				3
		CMC320	Prefabricated Water and Prestressed Concrete Structures	CMC208	3	2	0	2	4				3
Elective Course-4	Fifth	CMC407	Engineering for a Sustainable Environment	....	3	2	0	2	4				3
		CMC409	Environmental Engineering	FRB102	3	2	0	2	4				3
		CMC411	Special Topics in Structural Analysis	CMC102	3	2	0	2	4				3
Elective Course-5		CMC413	Advanced Engineering Materials	CMC104	3	2	0	2	4				3
		CMA415	Finishing Materials Technology	....	3	2	0	2	4				3
		CMA417	Principles and Approaches of Smart Cities	CMA210	3	2	0	2	4				3
Elective Course-6		CMC419	Modeling and Simulation of Construction Systems	CMC306	3	2	2	0	4				3
		CMC421	Geographic Information System GIS	CMC108	3	2	2	0	4				3
		CMC423	Modeling of structures	CMC102	3	2	2	0	4				3

8. Subject Area

Subject Area	Required	Program Total Credit Hours
		% Hours of five Levels
Humanities and Social Sciences	9-12%	8.75
Mathematics and Basic Sciences	20-26%	20
Basic Engineering Sciences	20-23%	20
Applied Engineering and Design	20-22%	20
Computer Applications and ICT	9-11%	11.25
Projects and Practice	8-10%	8.75
Discretionary	6-8%	11.25

9. Program Admission Requirements

- For obtaining a bachelor's degree in Construction Engineering and Management, registration is allowed for those who have a general secondary certificate or who are transferred from other faculties.
- Students who are not enrolled directly to the faculty of engineering, Benha University, through the National Coordination Office, but has achieved the minimum Engineering Sector requirement, can join the programs paying the separate Tuition Fees decided by the Faculty Council every year
- The required bachelor's degree duration **must not be less than 9 semesters**.
- The maximum study limit **is ten academic years**, provided that the student is enrolled at the minimum credit limit for one semester.
- The academic year consists of three semesters:
 - The first semester (the **Fall Semester**) and its duration is fifteen weeks and starts on the third Saturday of September.
 - The second semester (**Spring Semester**) and its duration is fifteen weeks and starts on the second Saturday of February.
 - The **Summer Semester** and its duration is not less than seven weeks and starts from the first Saturday of July.

10. Regulations for Progression and Program Completion

- For obtaining a bachelor's degree from the Faculty of Engineering in Benha in the new program, Credit Hours system, the student should be successfully passed in **160 credit hours**, and with average points of **at least 2.00**
- Success in the graduation Project

- Zero-Credit courses are marked as Pass or Fail (as the Summer Training). The student gets a grade but does not contribute to the cumulative GPA. To pass the course, the student should get at least 60% of the course total marks.
- The grades for each course are distributed in percentages between the semester work of research, reports and tests, Practical/oral exams, mid-semester exam, final written exam.
- A written exam is held for each course in the middle of the semester and a written exam at the end of the semester.
- The grades for each course are distributed according to the following table:

Work	Week	% Degree
First Exam (mid-term)	7	30
Second Exam (Written or Experimental Exam)	12	20
Semester Work	During the Semester	10
Final Exam	16	40

- grades for a project Graduation, are evaluated based on 50% semester work and 50% end-of-year discussion
- The student fails the course if he obtains an F grade (less than 60% of the course marks) or was not allowed to attend the final examination because of exceeding the absence percentage or cheating ... etc. or did not attend the final examination without submitting a prior excuse that is approved by the council of the administration of the program.
- For the student to pass a course, the minimum mark that must be earned in the final exam is 30% of the total exam marks, otherwise the student will fail the course irrespective of the total marks he earned in the course, and he will get an F grade in this course.
- The student must attend at least 75% of all course contact hours to be allowed to attend the course final examination.
- If the grades of one of the courses include a practical or oral test, they are included in the grades of the written exam (Second Exam).
- A student that absents from the final written exam is considered failed the course.
- If one of the courses does not include a written exam (such as the graduation project), the practical or oral exams are treated as the written exam.

11. Course Grades , Honors and Awards

- The student will be assessed in the exams each academic year, and the total grade will be according to one of the following:
 - A⁺ : More than 97% (Points =4.00), A : (93- 97)% (Points =4.00), A⁻ :(89- 93)% (Points = 3.70)

- **B⁺** : (84-89)% (Points =3.30), **B** : (80-84)% (Points =3.00), **B⁻** :(76-80)%(Points=2.70)
- **C⁺** : (73-76)% (Points =2.30), **C** : (70-73)% (Points =2.00), **C⁻** :(67-70)%(Points=1.70)
- **D⁺** : (64-67)% (Points =1.30), **D** : (60-64)% (Points =1.00)
- **F** : Less than 60%(Points=0.00)

- For a student to achieve the declaration of honor, he has to fulfill the following conditions:
 - Maintain a cumulative GPA of 3.3 throughout his study at the Program and any semester GPA should be higher than or equal 3.3.
 - Does not fail any course throughout his study at the Program.
 - Did not get any penalty throughout his study at the Faculty
- When a student repeats a course in which he previously obtained a grade (F) or was absent without an excuse (NE), the grade he obtained in the repetition is calculated with a maximum of (B+). but when he studies a course in which he previously obtained a grade of absence with an excuse (E), the grade is calculated for him which he obtained in the replay.
- In all cases, when calculating the cumulative average, it is calculated the last grade only, provided that both grades are mentioned in the student’s academic record.
- The points obtained by the student in each course are calculated as the number of credit hours for the course multiplied by the points obtained by the student according to the table of grades.
- Calculates the GPA Semester average score for any semester, by dividing the sum of Points earned by the student in this semester, divided by the total credit hours for these courses.
- The cumulative GPA is calculated at the end of each semester by dividing the sum of all course points that the student has studied by the sum of credit hours for these courses.
- The total cumulative point average is calculated by dividing the sum of all course’s points by the total number of credit hours studied by the student for these courses.

12. Program Evaluation

Evaluator	Tool	Sample
Senior Students	Questionnaire-meeting	50% of the students
Graduates	Questionnaire-meeting	25 % of the Graduates
Stakeholders	Questionnaire-meeting	10
Internal Evaluator		
External Evaluators		

13. Program Matrices

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13.1 Faculty Mission vs. Program Mission Matrix

		Program Mission		
		The Benha faculty of Engineering Construction Engineering and Management program aims to develop the skills and knowledge students need to successfully complete construction projects on time and on budget while adhering to construction standards and safety guidelines within human values and social responsibility. Graduates will have sufficient knowledge and skills to develop their postgraduate research skills and find a local or international employment in the commercial, design-build, and residential sectors of the construction industry.		
Faculty Mission		The Benha faculty of Engineering Construction Engineering and Management program aims to develop the skills and knowledge students need to successfully complete construction projects on time and on budget	Adhering to construction standards and safety guidelines within human values and social responsibility.	Graduates will have sufficient knowledge and skills to develop their postgraduate research skills and find a local or international employment in the commercial, design-build, and residential sectors of the construction industry.
Benha Faculty of Engineering - Benha University is committed to graduate well prepared engineers equipped with knowledge and skills necessary to compete in labor market, and capable of using and developing modern technology, and providing research in engineering fields to serve society and community.	Benha Faculty of Engineering - Benha University is committed to graduate well prepared engineers equipped with knowledge and skills necessary to compete in labor market	*		
	Capable of using and developing modern technology		*	
	Providing research in engineering fields to serve society and community			*

13.2 Program Mission vs. Program Objectives Matrix

Program Mission		Program Objectives					
		PO1	PO2	PO3	PO4	PO5	PO6
The Benha faculty of Engineering Construction Engineering and Management program aims to develop the skills and knowledge students need to successfully complete construction projects on time and on budget while adhering to construction standards and safety guidelines within human values and social responsibility. Graduates will have sufficient knowledge and skills to develop their postgraduate research skills and find a local or international employment in the commercial, design-build, and residential sectors of the construction industry.	The Benha faculty of Engineering Construction Engineering and Management program aims to develop the skills and knowledge students need to successfully complete construction projects on time and on budget	*				*	
	Adhering to construction standards and safety guidelines within human values and social responsibility.		*	*	*		
	Graduates will have sufficient knowledge and skills to develop their postgraduate research skills and find a local or international employment in the commercial, design-build, and residential sectors of the construction industry.				*	*	*

13.3 Student Competences Vs. (NARS 2018) CBE Matrix

Student Competences	(NARS 2018) CBE Matrix															
	A - Level										Civil				Arc.	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B1	B3
A 1	*															
A 2		*														
A 3			*													
A 4				*												
A 5					*											
A 6						*										
A 7							*									
A 8								*								
A 9									*							
A 10										*						
B 1											*					
B 2												*				
B 3													*			
B 4														*		
D 1															*	
D 2																*

13.4 Program Learning Outcomes Vs. (NARS 2018) CBE Matrix

Program Learning Outcomes	(NARS 2018) CBE Matrix															
	A - Level										Civil				Arc.	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B1	B3
PLO 1	*															
PLO 2		*														
PLO 3			*													
PLO 4				*												
PLO 5					*											
PLO 6						*										
PLO 7							*									
PLO 8								*								
PLO 9									*							
PLO 10										*						
PLO 11											*					
PLO 12												*				
PLO 13													*			
PLO 14														*		
PLO 15															*	
PLO 16																*

13.5 Program Learning Outcomes Vs. Student Competences

Program Learning Outcomes	Student Competences															
	A - Level										B-Level				D-Level	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2
PLO 1	*															
PLO 2		*														
PLO 3			*													
PLO 4				*												
PLO 5					*											
PLO 6						*										
PLO 7							*									
PLO 8								*								
PLO 9									*							
PLO 10										*						
PLO 11											*					
PLO 12												*				
PLO 13													*			
PLO 14														*		
PLO 15															*	
PLO 16																*

13.6 Program Mission vs. (NARS 2018) CBE Matrix

Program Mission		(NARS 2018) CBE															
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2
The Benha faculty of Engineering Construction Engineering and Management program aims to develop the skills and knowledge students need to successfully complete construction projects on time and on budget while adhering to construction standards and safety guidelines within human values and social responsibility. Graduates will have sufficient knowledge and skills to develop their postgraduate research skills and find a local or international employment in the commercial, design-build, and residential sectors of the construction industry.	The Benha faculty of Engineering Construction Engineering and Management program aims to develop the skills and knowledge students need to successfully complete construction projects on time and on budget	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*
	Adhering to construction standards and safety guidelines within human values and social responsibility.			*		*	*	*	*	*	*			*		*	*
	Graduates will have sufficient knowledge and skills to develop their postgraduate research skills and find a local or international employment in the commercial, design-build, and residential sectors of the construction industry.				*	*	*	*	*		*		*	*	*		

13.7 Program Objectives vs. (NARS 2018) CBE Matrix

Program Objectives	Program Competencies															
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2
PO1	*	*		*					*		*	*		*	*	
PO2		*	*				*			*		*	*	*	*	*
PO3							*	*	*				*	*		
PO4					*	*		*		*					*	*
PO5	*	*		*		*	*	*			*	*	*	*	*	*
PO6	Will be covered through postgraduate courses															

13.8 Program Objectives vs. Graduate Attributes Matrix

Program Objectives	Graduate Attributes												
	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12	GA13
PO1	*	*					*				*		*
PO2			*		*	*		*				*	
PO3				*						*		*	
PO4						*			*			*	
PO5							*				*		*
PO6								*			*	*	*

13.9 Graduate Competencies Vs Graduate Attributes

Graduate Competencies	Graduate Attributes												
	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12	GA13
A1	*	*									*		*
A2		*											*
A3			*		*	*					*		*
A4						*	*				*		*
A5								*			*		*
A6				*								*	
A7				*								*	
A8									*			*	
A9										*		*	
A10								*			*	*	
B1											*		
B2											*		
B3												*	
B4												*	
D1												*	*
D2												*	*

13.10 Student Competencies Vs Courses

Compulsory Courses		Student Competencies																
Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D1	Total
UHS101	Foreign Language								1		1							
UHS102	Information and Communication Technology				1						1							
UHS103	Social issues							1			1							
UHS 104	Professional Ethics				1	1												
UHS XXX	Humanities Elective I			1	1													
UHS XXX	Humanities Elective II								1	1								
UHS XXX	Humanities Elective III					1					1							
FRB001	Analytical geometry & Linear Algebra	1		1														
FFB002	Integration & Multivariable functions	1		1														
FRB101	Engineering Differential Equations	1	1															
FRB104	Engineering Numerical Analysis	1	1															
FRB201	Applied Engineering Probability and Mathematical Statistics	1	1															
FRB007	Chemistry for Engineers	1	1															
FRB103	Environmental Pollution and Industrial Safety	1	1		1													
FRB102	Water Chemistry	1		1	1													
FRB005	Waves and Heat	1	1															
FRB006	Electricity and Magnetism	1	1															
FRM009	Engineering Graphics						1		1									
FRM008	Production Systems Engineering				1	1												
FRM010	Computer Aided Drafting				1					1								
FRE012	Computer Programming Fundamentals	1		1														
FRB003	Statics	1	1															
FRB004	Dynamics	1	1															
CMC106	Construction Engineers Drawing								1				1					

Compulsory Courses		Student Competences																
Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D1	Total
CMC 101	Structural Analysis-1	1										1						
CMC 102	Structural Analysis-2	1										1						
CMC 201	Hydrology and Water Resources	1										1	1					
CMC 103	Properties and Testing of Construction Materials		1									1						
CMC 104	Construction Materials and Concrete Technology		1									1						
CMC 105	Surveying for Engineers-1		1					1				1						
CMC 108	Surveying for Engineers-2					1						1						
CMM 301	Technical Installations in Buildings		1	1		1						1					1	
CMA 107	Basic Architectural Engineering								1							1		
CMA 110	Building Construction					1			1								1	
CMA 210	Introduction to City Planning						1									1	1	
CMC 109	Fluid Mechanics	1	1									1						
CMC 112	Hydraulics for Construction Engineers		1	1								1						
CMC 401	Project Finance & Management		1				1							1	1			
CMC 203	Soil Mechanics		1			1						1						
CMC 204	Geotechnical Engineering and Foundations		1	1								1	1					
CMC 205	Design and Construction of Foundations & Earth Retaining Structures			1									1				1	
CMC 205	Design of Metallic Structures-1			1	1								1				1	
CMC 207	Design of R.C. Structures-1			1	1								1				1	
CMC 208	Design of R.C. Structures-2			1	1								1				1	
CMC 309	Quality Control & Inspection of Structures						1			1				1		1		
CMC 206	Construction Project Management						1	1		1				1	1			
CMC 307	Cost Engineering & Quantity Surveying						1							1	1			
CMC 306	Project Planning, Scheduling, and Control		1				1							1	1			

Compulsory Courses		Student Competences																
Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D1	Total
CMC 403	Construction Project Specifications, Bids, and Contracts						1							1	1			
CMC 302	Sanitary Engineering		1										1					
CMC 202	Transportation and Traffic Engineering	1	1			1							1	1				
CMC 303	Methods and Equipment for Construction					1	1					1						
CMC 304	Construction and Site Safety				1		1							1		1		
CMC 308	Senior Design Project I			1	1		1	1	1	1	1	1	1	1	1	1	1	
CMC 405	Senior Design Project II			1	1		1	1	1	1	1	1	1	1	1	1	1	
CMC 3XX	Program Elective Courses I				1	1						1		1			1	
CMC 3XX	Program Elective Courses II						1							1	1			
CMC/E380	CMC 3XX				1									1				1
CMC/E480	CMC 4XX				1	1									1			

13.11 Student Competencies Vs Learning and Teaching Methods

Teaching & Learning Methods	Program Learning Outcomes															
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2
Lecture	*		*	*		*		*			*	*	*	*	*	*
Tutorials	*		*	*		*		*			*	*	*	*	*	*
Computer-based Instruction		*		*							*	*	*	*		*
Problem-based Learning	*			*					*		*	*	*	*		*
Project-based Learning			*			*	*		*				*		*	*
Interactive Learning		*					*	*	*	*	*					*
Presentations		*	*	*	*				*		*	*	*	*	*	*
Case Study			*	*					*	*			*		*	*
Report					*		*		*	*	*	*				
Co-operative Learning					*		*				*					*
Brain Storming				*			*	*	*				*			
Projects			*			*	*	*	*							*
Discussion	*	*	*					*		*	*	*	*	*	*	*
Practical-based Learning		*		*		*	*	*			*	*	*	*		
Self-Learning					*					*	*					
Hybrid Learning	*		*	*	*				*	*	*	*	*	*	*	*
Teaching and Learning Methods for Students with Special Needs:																
Methods																
1. Discussion Session																
2. Extra Lectures																
3. Create classroom centers																
4. Rotate lessons																
5. Provide different levels of books and materials																

13.12 Student Competencies Vs Assessment Methods

Teaching & Learning Methods		Program Learning Outcomes															
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2
Formative Assessment Method																	
Tests	Oral Test		*			*	*	*	*	*	*	*					
	Written Exam	*		*	*		*		*			*	*	*	*	*	*
	Experimental		*					*					*	*	*		
	Quizzes	*	*	*	*		*		*			*	*	*	*	*	*
Reports		*	*			*		*		*	*	*	*				
Observation		*	*			*		*		*	*	*	*				
Discussions		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Projects	Projects		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Mini Projects		*	*		*	*	*	*	*	*	*	*	*	*	*	*
Assignments		*	*	*	*		*		*			*	*	*	*	*	*
Presentations					*	*	*	*		*	*	*	*	*	*	*	*
Summative Assessment Method																	
Practical			*					*				*	*	*			
Oral Exam			*			*	*	*	*	*	*	*					
Final Exam		*		*	*		*		*		*	*	*	*	*	*	*

13.13 Assessment Methods Vs. Teaching and Learning Methods

Assessment Methods		Teaching and Learning Methods															
		Lecture	Tutorials	Computer-based Instruction	Problem-based Learning	Project-based Learning	Interactive Learning	Presentations	Case Study	Report	Co-operative Learning	Brain Storming	Projects	Discussion	Practical-based Learning	Self-Learning	Hybrid Learning
Formative Assessment Method																	
Tests	Oral Test					*		*	*	*			*	*	*	*	*
	Written Exam	*	*										*				*
	Experimental			*										*			
	Quizzes	*	*										*				*
Reports								*		*			*			*	*
Observation					*		*				*	*					
Discussions		*	*		*	*		*	*	*			*				*
Projects	Projects				*		*	*	*	*	*		*	*	*	*	*
	Mini Projects				*	*	*	*	*	*	*		*	*			*
Assignments			*	*	*												*
Presentations		*				*		*	*	*			*			*	*
Summative Assessment Method																	
Practical				*											*		
Oral Exam						*		*	*	*			*	*	*	*	*
Final Exam		*	*										*				*