

برنامج هندسة وإدارة التشييد

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أ. أهداف البرنامج

هندسة وإدارة التشييد هو مجال علمي ومهني يختص بتصميم وتنفيذ وإدارة مشاريع التشييد والتي تشمل: الاحترافية في التصميم الهندسي و استيعاب الممارسة القانونية والمهنية ذات الصلة بصناعة البناء والتشييد وفهم عمليات التشييد وأساليب التنفيذ والمواد والأنظمة والمعدات والتخطيط والجدولة الزمنية والسلامة المهنية وتحليل ومراقبة التكاليف. وكذلك تشمل فهم موضوعات الإدارة مثل الاقتصاد والأعمال، والمحاسبة والقانون والاحصاء وأخلاقيات المهنة والقيادة واتخاذ القرارات وأساليب التطوير وتحليل وتصميم العمليات واقتصاديات الهندسة وإدارة الهندسة والسلامة وهندسة التكاليف.

ونظرا لأهمية هذا المجال وخاصة في ضوء نهضة التشييد و المشاريع القومية التي تشهدها مصر في هذه العقود تسعى كليات الهندسة في انشاء برامج متخصصة في هذا المجال تعمل على تخريج مهندسين متخصصين في هذه الأعمال وتلبى حاجة سوق العمل لهذا التخصص ويكون لديهم القدرة على تصميم وإدارة عمليات التشييد التي تخلق الحياة والبيئة العملية مثل المباني الإدارية والمباني الصناعية والمطارات والمباني السكنية والطرق والجسور والمرافق ومشاريع الموارد المائية ومشاريع هندسة الساحلية.

ومهندسى هذا البرنامج يمكنهم العمل في مشاريع إدارة وهندسة التشييد والمنشآت بكافة أنواعها و الهندسة الجيوتقنية و الأساسات و أعمال الهندسة البيئية ومشروعات المنشآت المائية ومشاريع الحماية الساحلية.

وفيما يلي بعض من فرص العمل التي يمكن استخدامها من قبل خريجي البرنامج:

- **مهندس تصميم:** وضع أساسيات و تفاصيل العديد من مشاريع البناء مثل المباني الإدارية والمباني الصناعية والمطارات و المباني السكنية والطرق والجسور والمنشآت المائية، المنشآت الساحلية، والمرافق، والسدود.
- **مهندس موقع (إشراف أو تنفيذ):** يطبق و ينسق عمليات التشييد المختلفة في الموقع.
- **مهندس مساحة:** القيام بعمليات الرفع المساحي لجميع أنواع مشاريع التشييد.
- **مهندس تقدير تكاليف:** تقدير تكاليف تفصيلية وميزانيات للتصميمات و عمليات التنفيذ على أساس المعرفة وعمليات ما قبل التصميم و تقدير المواد و متطلبات الموارد الأخرى.
- **مهندس تخطيط و جدولة زمنية:** التخطيط ومراقبة الخطة بالنسبة للتوقيت وتتابع عمليات و أنشطة التشييد.

- مهندس مراقبة الجودة / ضمان الجودة: يضمن أن بنود مشروع البناء وعمليات البناء مطابقة للمواصفات والمعايير.
- مهندس متابعة مشاريع: يستعرض أداء التكلفة والوقت للمشروع أثناء عملية التشييد.
- مهندس عقود: يقوم بمراجعة بنود العقد للمشروع وإعداد / تغيير أوامر التغيير والمطالبات.
- مهندس الصحة والسلامة والبيئة: مراجعة و تنفيذ نظام الصحة والسلامة للمشروع لضمان معايير الصحة والسلامة في جميع مراحل المشروع.
- مهندس المشروع: يقوم بعمل تصاميم كل أو جزء من عمليات تنفيذ المشروع وينسق هندسة العمل لتحقيق الأهداف العامة لفريق التصميم.

سمات مهندس التشييد

الهدف الرئيسي للبرنامج هندسة التشييد والبناء هو إعداد مهندس قادر على العمل المهني في مجال هندسة التشييد والبناء من خلال اكساب الدارسين المهارات التقنية الضرورية والمهارات الشخصية والمعرفة في مجال هندسة التشييد والبناء. ويعد الهدف الرئيسي من هذا البرنامج هو تأهيل طلبة قسم هندسة البناء والتشييد لذلك.

- بالإضافة إلى السمات العامة للمهندس، فإن مهندس التشييد خريج هذا البرنامج سوف يكون قادراً على:
 - تطبيق التقنيات التحليلية و التجريبية و تصميم وهندسة المنشآت وإدارتها مع إجابة استخدام الأدوات الحديثة لذلك.
 - فهم التطبيقات العالمية والأخلاقية والاجتماعية للمهنة في ما يخص قضايا السلامة والاستدامة العامة.
 - تحصيل والاستفادة والتواصل وامتلاك مهارات القيادة الشخصية و قادر على العمل بشكل تعاوني في فريق متعدد التخصصات.
 - مواصلة العمل المتميز و التعلم المستمر مدى الحياة.

ب. المخرجات التعليمية للبرنامج:-

وفقاً للهيئة القومية لضمان جودة التعليم والاعتماد، يجب أن يلي برنامج هندسة وإدارة مواقع التشييد مخرجات التعلم التالية:-

أولاً: مخرجات المعرفة والفهم

- يجب أن يكون خريج برنامج هندسة وإدارة التشييد قادر على إثبات المعرفة والفهم في:
1. المفاهيم والنظريات الرياضيات والعلوم الأساسية.
 2. أساسيات تكنولوجيا المعلومات والاتصالات.

3. خصائص المواد الهندسية.
4. مبادئ التصميم بما في ذلك عناصر التصميم، لعملية و/أو لنظام.
5. منهجيات حل المشاكل الهندسية، وجمع البيانات وتفسيرها.
6. نظم ضمان الجودة و أكواد الممارسات والمعايير، ومتطلبات الصحة والسلامة والقضايا البيئية.
7. مبادئ إدارة الأعمال ذات الصلة بالهندسة.
8. التقنيات الهندسية الحالية.
9. مواضيع تتعلق بالاهتمامات الإنسانية والقضايا الأخلاقية.
10. اللغة الفنية وكتابة التقارير الفنية.
11. الأخلاق المهنية وتأثيرات الحلول الهندسية على المجتمع والبيئة.
12. الموضوعات الهندسية المعاصرة.
13. عمليات التشييد الأساسية والتكنولوجيات والتقنيات المستخدمة في مجال هندسة التشييد والبناء.
14. مبادئ علوم هندسة التشييد والبناء وتطبيقها على مبادئ الهندسة المدنية.
15. خواص وسلوك وتصنيع مواد التشييد.
16. مبادئ التصميم الخاصة بالتشييد والبناء.
17. إدارة المشاريع بما في ذلك التخطيط والتمويل وتقديم العطاءات، وإجراءات العقد، و تقدير التكلفة وأنظمة الجودة.
18. الأساليب التحليلية تطبيقات الكمبيوتر التي يمكن تطبيقها على مختلف مجالات هندسة التشييد والمباني.

ثانياً: مخرجات المهارات الفكرية

- يجب أن يكون خريج برنامج هندسة وإدارة مواقع التشييد (CSM) قادر على إظهار المهارات الفكرية التالية:-
1. اختيار الطرق الرياضية والتي تعتمد على الكمبيوتر المناسبة للنموذج وتحليل المشاكل.
 2. اختيار الحلول المناسبة للمشاكل الهندسية القائمة على التفكير التحليلي.
 3. التفكير بطريقة خلاقة ومبتكرة في حل و تصميم المشكلات.
 4. جمع وتبادل وتقييم الأفكار المختلفة، وجهات النظر، والمعرفة من مجموعة من المصادر.
 5. تقييم خصائص وأداء المكونات والنظم والعمليات.
 6. فحص انهيار المكونات والنظم والعمليات.
 7. حل المشاكل الهندسية، وغالبا على أساس معلومات محدودة وربما متناقضة.

8. اختيار وتقييم أدوات تكنولوجيا المعلومات والاتصالات المناسبة لمجموعة متنوعة من المشاكل الهندسية.
9. تحديد القرارات الهندسية المتعلقة بالتكاليف المتوازنة، والفوائد، والسلامة، والجودة، والموثوقية، والأثر البيئي.
10. دمج الأبعاد المجتمعية والاقتصادية والبيئية وإدارة المخاطر في التصميم.
11. تحليل نتائج النماذج العددية وتقييم حدودها.
12. خلق أساليب منظمة ومنهجية عند التعامل مع التكنولوجيا الجديدة والمتقدمة.
13. تعريف وحل مشاكل هندسية التشييد.
14. حل المشاكل البيئية والاجتماعية والاقتصادية.
15. تحديد مستويات وأنواع وأنظمة المنشآت و تحديد مستويات وأنواع وأنظمة اساسات المنشآت بناء على تقنيات الجيوتقنية أصول الهندسة.
16. تقييم ودمج المعلومات والعمليات من خلال العمل في المشروع فردياً وجماعياً.
17. حل مجموعة واسعة من المشاكل المرتبطة بتحليل وتصميم وتنفيذ المباني ومشاريع الهندسة المدنية.
18. تحليل وتفسير المعلومات التمويلية.
19. اقتراح حلول وتصاميم على المستوى الأساسي وفي التفاصيل بالنظر إلى الاستدامة وغيرها من القضايا ذات الأهمية

ثالثاً: مخرجات عملية ومهنية

- يجب أن يكون خريج برنامج هندسة وإدارة التشييد قادر على إظهار المهارات العملية و المهنية التالية:-
1. تطبيق المعرفة في الرياضيات، والعلوم، وتكنولوجيا المعلومات والتصميم وسياق الأعمال والممارسات الهندسية مجمعة لحل للمشاكل الهندسية.
 2. الدمج المهني للمعرفة والفهم الهندسي، وردود الفعل لتحسين تصميم المنتجات و/أو الخدمات.
 3. إنشاء و/أو إعادة تصميم عملية، مكون أو نظام، وتنفيذ التصاميم الهندسية المتخصصة.
 4. التدريب على الدقة والجمالية في التصميم والنهج.
 5. استخدام المرافق والتقنيات الحاسوبية، وأدوات القياس وورش العمل والمعدات المختبرية لتصميم التجارب، وذلك لجمع وتحليل وتفسير النتائج.
 6. استخدام مجموعة واسعة من الأدوات التحليلية والتقنيات والمعدات، وحزم البرمجيات المتعلقة لتطوير برامج الكمبيوتر المطلوبة.

7. تطبيق أساليب النمذجة العددية للمشاكل الهندسية.
8. تطبيق أنظمة أمانة في العمل ومراقبة الخطوات المناسبة لإدارة المخاطر.
9. إظهار المهارات التنظيمية الأساسية ومهارات إدارة المشاريع.
10. تطبيق إجراءات ضمان الجودة واتباع القوانين والمعايير.
11. تبادل المعارف والمهارات مع المجتمع الهندسي والصناعي.
12. إعداد و عرض التقارير الفنية.
13. إعداد وتنفيذ مشاريع هندسة التشييد.
14. استخدام معدات الموقع و المعمل بكفاءة وأمان.
15. مراقبة وتسجيل وتحليل البيانات في المختبر و الموقع.
16. استخدام أدوات المساعدة القائمة على الحاسوب وحزم البرمجيات لحل المشكلات وتحليل النتائج.
17. إعداد مسودات فنية ورسومات نهائية يدويا وباستخدام الحاسب.
18. إعداد تقارير حصر الكميات و تقديرات التكلفة، وجداول التنفيذ.
19. إدارة العقود و التحكم في الوقت والتكلفة والجودة للمشاريع.
20. عمل جداول لتحقيق المواعيد النهائية في الأنشطة المعقدة.

رابعاً: مخرجات عامة و قابلة للنقل

يجب أن يكون خريج برنامج هندسة وإدارة التشييد قادر على إظهار المهارات العامة و القابلة للنقل التالية:-

1. التعاون بشكل فعال ضمن فريق متعدد التخصصات.
2. العمل في بيئة ضاغطة وضمن القيود.
3. التواصل الفعال.
4. إظهار قدرات تكنولوجيا المعلومات فعالة.
5. قيادة وتحفيز الأفراد.
6. إدارة فعالة للمهام والوقت والموارد.
7. البحث عن المعلومات والمشاركة في نظام التعلم الذاتي طويل المدى.
8. اكتساب مهارات تنظيم المشاريع والرجوع إلى الأدبيات ذات الصلة.

نسب المقررات الدراسية

يبين الجدول التالي نسب توزيع المقررات الدراسية للبرنامج ومقارنتها بمتطلبات الهيئة القومية لضمان جودة التعليم والاعتماد.

	Subject Area	CR	%	NARS Requirements
A	Humanities and Social Sciences (Univ. Req.)	18	10.11	9-12%
B	Mathematics and Basic Sciences	36	20.22	20-26%
C	Basic Engineering Sciences (Faculty/Spec. Req.)	40	22.47	20-23%
D	Applied Engineering and Design	39	21.91	20-22%
E	Computer Applications and ICT	18	10.11	9-11%
F	Projects and Practice	15	8.42	8-10%
G	Discretionary (Institution character-identifying)	12	6.74	6-8%
Total		178		100%

A. Humanities and Social Sciences (Univ. Req.) Courses

Code	Course Title	Credit Hours
HS101	English Language	2
HS102	Human Rights	2
HS201	Technical Writing	2
HS202	Engineering Economics	2
HS401	Legislation and Engineering Ethics	2
Humanity – Elective 1 (Student shall select one from)		2
HS302	Human Resource Management	
HS304	Strategic Management	
HS306	Computer and Society	
HS308	Accounting	
Humanity – Elective 2 (Student shall select one from)		2
HS402	Foundations of Marketing	
HS404	Introduction to Finance	
HS406	Human Computer Interaction	
UHS408	Sustainable Development	
Humanity – Elective 3 (Student shall select one from)		2
HS501	Specifications and feasibility studies	
HS503	Analytical Skills and Critical Thinking	
HS505	Communication Laws and Codes	
HS507	Construction Contracts and Law	
Humanity – Elective 4 (Student shall select one from)		2
HS502	Professional Communication Skills	
HS504	Principles of industrial health	
HS506	Social Risks and Security of Computer Systems	
HS508	Risk Management	
Total Hours		18

B. Mathematics and Basic Sciences Courses

Code	Course Name	Credit Hours
FRB101	Mathematics I	3
FRB102	Mathematics II	3
FRB201	Mathematics III	3
FRB202	Mathematics IV	3
FRB107	Physics I	3
FRB108	Physics II	3
FRB103	Mechanics I	3
FRB104	Mechanics II	3
FRB105	General Chemistry	3
FRE102	Computer Programming	3
FRB301	Numerical Methods	3
FRB302	Probabilities & Statistics	3
TOTAL		36

C. Basic Engineering Sciences (Faculty/Spec. Req.) Courses

Code	Course Name	Credit Hours
FRM109	Engineering Graphics	4
FRM106	Production Engineering	3
CMC201	Structural Analysis I	3
CMC202	Structural Analysis II	3
CMC203	Properties of Engineering Materials	3
CMC204	Construction Materials	3
CMC205	Construction Engineering Drawings	2
CMC207	Surveying for Engineers-1	3
CMC208	Basic architectural Engineering	2
CMC209	Concrete Technology	2
CMC210	Fundamental of Thermal Engineering	3
CMC301	Hydraulics for Civil Engineers	3
CMC302	Water Resources, Irrigation and Drainage	3
CMC303	Structural Analysis III	3
Total		40

D. Applied Engineering and Design Courses

Code	Course Title	Credit Hours
CMC304	Design of R.C. structures-1	3
CMC305	Soil Mechanics	3
CMM308	Technical Installations in Buildings	3

CMC401	Design of Metallic Structures-1	3
CMC402	Design of Metallic Structures-2	3
CMC403	Environmental & Sanitary Engineering	3
CMC404	Design of Hydraulic Structures	3
CMC406	Environmental Engineering	3
CMC407	Foundation Engineering	3
CMC409	Design of R.C. Structures-2	3
CMC412	Highway Engineering	3
CMC501	Concrete and Steel Bridges	3
CMC503	Dynamics of Structures	3
Total		39

E. Computer Applications and ICT Courses

Code	Course Title	Credit Hours
CMC206	CAD for Civil Engineering	3
CMC306	Surveying for engineers-2	3
CMC307	Building Construction & City Planning	3
CMC309	Project Management	2
CMC405	Construction Management	2
CMC411	Cost Engineering & Quantity Surveying	2
CMC502	Computer Applications in Civil Engineering	3
Total		18

F. Projects and Practice Courses

Code	Course Title	Credit Hours
CMC408	Construction Methods	2
CMC410	Slope Stability & Retaining Structure	2
CMC504	Quality Control & Inspection of Structures	3
CMM506	Equipment for Construction	2
EMM(E)521	Project I	3
EMM(E)522	Project II	3
Total		15

G. Elective Courses

Code	Course	Credit Hours
Elective Course-1		3
CMC505	Building Construction	
CMC507	Advanced Engineering Materials	
CMC509	Special Topics in Structural Analysis	
Elective Course-2		3
CMC 511	Techniques of Planning, Scheduling and Project Control	
CMC 513	Construction Management-2	
CMC515	Urban Planning	
Elective Course-3		3
CMM508	Transportation & Logistics	
CMM 10	Prefabricated Water and Prestressed Concrete Structures	
CMC512	Analysis and Design of Composite Structures	
Elective Course-4		3
CMC 514	Special Topics in Geotechnical Engineering	
CMC516	Total Quality Management	
CMC 518	Value Engineering in the Construction Industry	
TOTAL		12

- كما يجب ان يؤدي الطالب تدريب ميداني 240 ساعة على مرحلتين بواقع 120 ساعة (3 أسابيع) في كل مرحلة في فترة الصيف في أحد المنشأة الصناعية في مجال التخصص حسب الجدول التالي:

Code	Course Title	Credit Hours	Prerequisites
CMC/E380	Field Training I	1	120 Credit Hours
CMC/E480	Field Training II	1	120 Credit Hours

- ويجوز تدريب الطلاب خارج جمهورية مصر العربية ولا يحصل الطالب على شهادة البكالوريوس إلا بع اجتياز التدريب بنجاح. حيث أن على الطالب تقديم تقرير حول التدريب الميداني الذي حصل عليه و يتم مناقشته فيه فور انتهائه من التدريب.

Program Courses Prerequisites

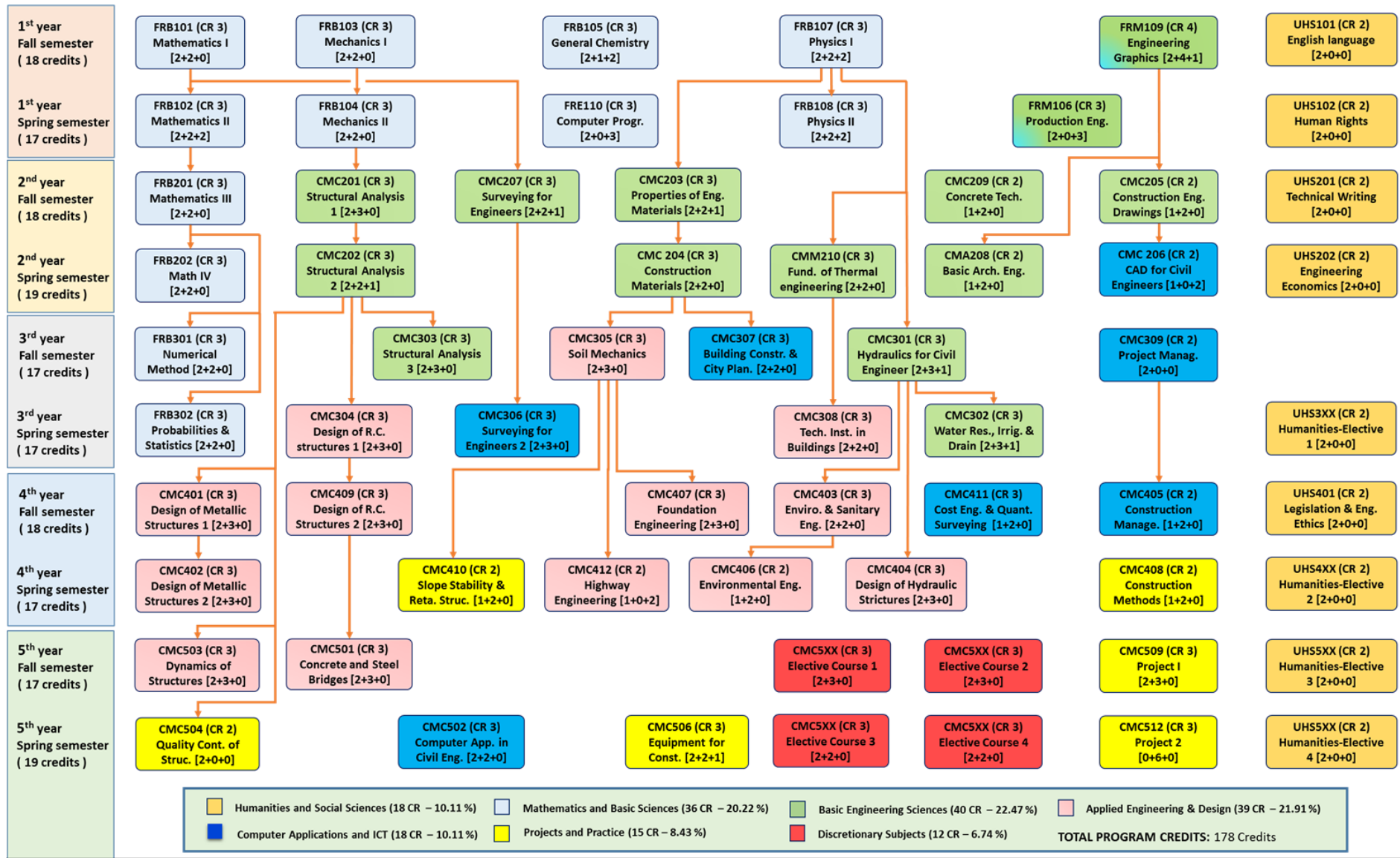
	Fall			Spring		
	Code	Course Name	Prerequi sites	Code	Course Name	Prerequi sites
First Year	FRB101	Mathematics I		FRB102	Mathematics II	FRB101
	FRB103	Mechanics I		FRB104	Mechanics II	FRB103
	FRB105	General Chemistry		FRM106	Production Engineering	
	FRB107	Physics I		FRB108	Physics II	FRB107
	FRM109	Engineering Graphics		FRE110	Computer Programming	
	UHS101	English language		UHS102	Human Rights	
Second Year	FRB201	Mathematics III	FRB102	FRB 202	Mathematics IV	FRB201
	CMC201	Structural Analysis-1	FRB104	CMC202	Structural Analysis- 2	CMC201
	CMC203	Properties of Engineering Materials	FRB107	CMC 204	Construction Materials	CMC203
	CMC205	Construction Engineering Drawings	FRM109	CMC 206	CAD for Civil Engineers	CMC205
	CMC207	Surveying for engineers-1	FRB101	CMA208	Basic Architectural Engineering	FRM109
	CMC209	Concrete Technology		CMM210	Fundamental of Thermal engineering	FRB107
	UHS201	Technical Writing		UHS202	Engineering Economics	
Third Year	FRB 301	Numerical Method	FRB201	FRB 302	Probabilities & Statistics	FRB201
	CMC301	Hydraulics for Civil Engineer	FRB107	CMC302	Water Resources, Irrigation & Drainage	CMC301
	CMC303	Structural Analysis-3	CMC202	CMC304	Design of R.C. structures-1	CMC202
	CMC305	Soil Mechanics	CMC204	CMC306	Surveying for engineers-2	CMC207
	CMC307	Building Construction & City Planning	CMC204	CMM308	Technical Installations in Buildings	CMM210
	CMC309	Project Management		UHS3XX	Humanities–Elective 1	
Fourth Year	CMC401	Design of Metallic Structures-1	CMC202	CMC402	Design of Metallic Structures-2	CMC401
	CMC403	Environmental & Sanitary Engineering	CMC301	CMC404	Design of Hydraulic Structures	CMC301
	CMC405	Construction Management	CMC309	CMC406	Environmental Engineering	CMC403
	CMC407	Foundation Engineering	CMC305	CMC408	Construction Methods	
	CMC409	Design of R.C. Structures- 2	CMC304	CMC410	Slope Stability & Retaining Structure	CMC305
	CMC411	Cost Engineering & Quantity Surveying		CMC412	Highway Engineering	CMC305
	UHS401	Legislation & Engineering Ethics		UHS4XX	Humanities – Elective 2	
Fifth Year	CMC501	Concrete and Steel Bridges	CMC409	CMC502	Computer Applications in Civil Engineering	FRE110
	CMC503	Dynamics of Structures	CMC202	CMC504	Quality Control & Inspection of Structures	CMC202
	CMC5XX	Elective Course-1		CMM506	Equipment for Construction	
	CMC5XX	Elective Course-2		CMC5XX	Elective Course-3	

Fall			Spring		
Code	Course Name	Prerequisites	Code	Course Name	Prerequisites
CMC509	Project-1		CMC5XX	Elective Course-4	
UHS5XX	Humanities-Elective3		CMC512	Project-2	
			UHS5XX	Humanities-Elective4	

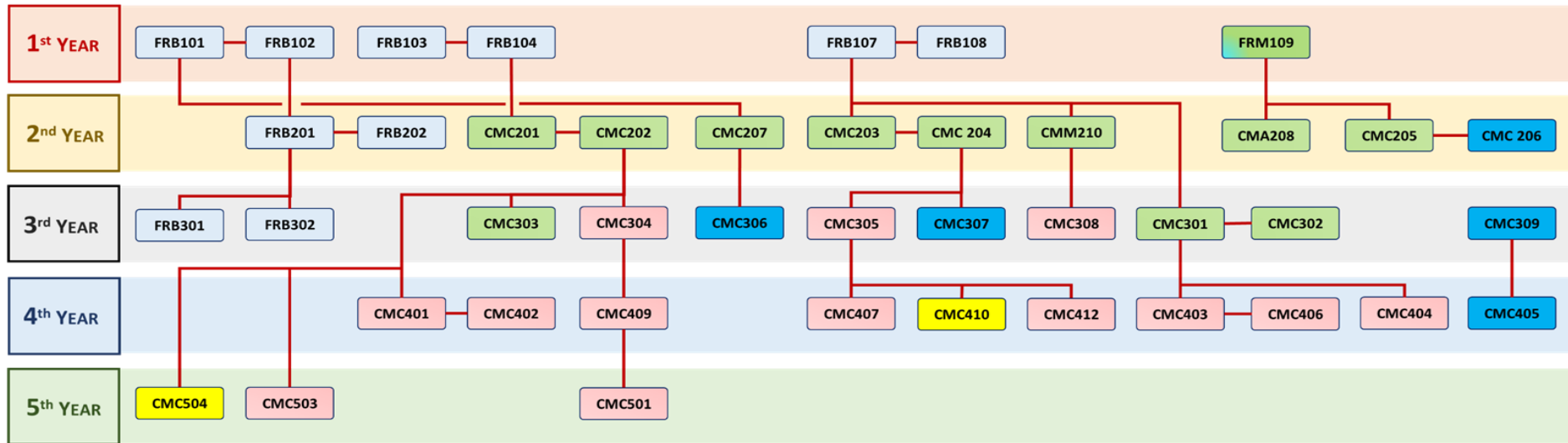
Elective Course Prerequisites

Code	Course	Prerequisites
Elective Course 1		
CMC505	Building Construction	
CMC507	Advanced Engineering Materials	CMC202, CMC204
CMC509	Special Topics in Structural Analysis	CMC202
Elective Course 2		
CMC 511	Techniques of Planning, Scheduling and Project Control	CMC309
CMC 513	Construction Management-2	CMC405
CMC515	Urban Planning	CMC307
Elective Course 3		
CMM508	Transportation & Logistics	
CMM510	Prefabricated Water and Prestressed Concrete Structures	CMC409
CMC512	Analysis and Design of Composite Structures	CMC402
Elective Course 4		
CMC 514	Special Topics in Geotechnical Engineering	CMC407
CMC516	Total Quality Management	CMC504
CMC 518	Value Engineering in the Construction Industry	

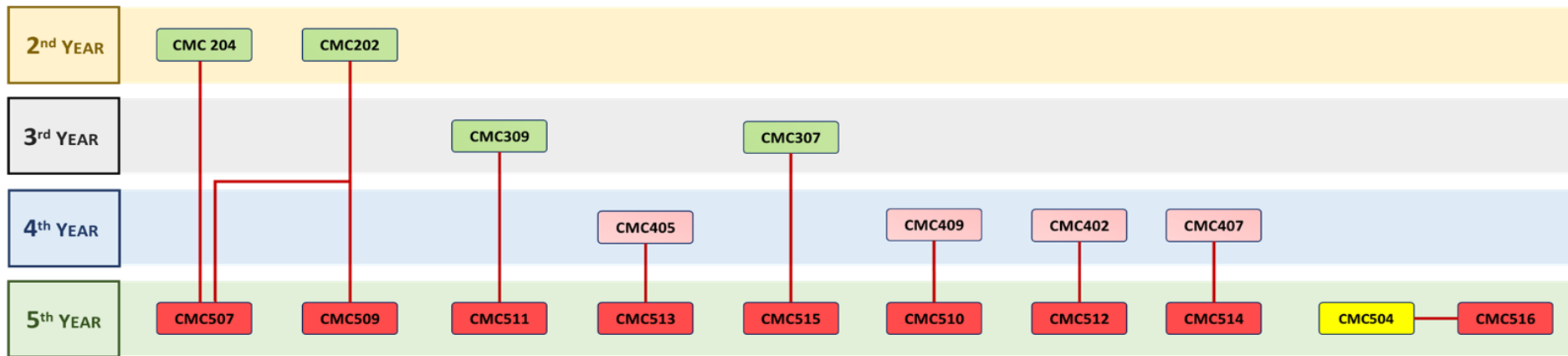
STUDY PLAN FOR CONSTRUCTION ENGINEERING AND MANAGEMENT PROGRAM – CLASS 2017



PREREQUISITES PLAN FOR CONSTRUCTION ENGINEERING AND MANAGEMENT PROGRAM



ELECTIVES PREREQUISITES



COURSE DESCRIPTION

<p>CMC 201 Structural Analysis-1 3 (2, 3, 0)</p> <p><i>Prerequisites: FRB 104 Mechanics II</i></p> <p>Definition of a structure, its support condition and its various structural forms in addition various loading conditions that a structure must support. Study the stability and determinacy of structures. Basic concepts of structural analysis. Calculations of reaction forces, calculations of the internal forces (normal forces, shear forces and bending moments) and its distribution on statically determinate beams, frames and arches Member forces in trusses. Influence lines and its use to calculate the maximum response functions in structures.</p> <p><i>Text Book</i></p> <p>Structural Analysis by Russell C. Hibbeler, Pearson, 9th Edition, 2014</p>
<p>CMC 202 Structural Analysis-2 3 (2, 2, 1)</p> <p><i>Prerequisites: CMC 201 Structural Analysis-1</i></p> <p>Properties of Areas, Normal stresses: Axial stresses, Shear stresses, thermal stress and bending stresses. Transverse loading and torsional stresses, Principal stresses and strains, Elastic deflection of beams. Method of three-moments equations for continuous beams. Buckling of columns.</p> <p><i>Text Book</i></p> <p>Structural Analysis by Aslam Kassimali, CL Engineering, 5th Edition, 2014</p>
<p>CMC203 Properties of Engineering Materials 3 (2, 2, 1)</p> <p><i>Prerequisites: FRB107Physics I</i></p> <p>Mechanical, physical and chemical properties of engineering materials. Stress-strain behavior, strength, ductility, toughness, and resilience - Testing machines - Calibration devices - Strain gauges - Mechanical properties in tension, compression, bending, shear and torsion. Impact – Fatigue - Hardness.</p> <p><i>Text Book</i></p> <p>Engineering Materials: Properties and Selection by Kenneth G. Budinski, Pearson, 9th Edition, 2014</p>
<p>CMC 204 Construction Materials 3 (2, 2, 0)</p> <p><i>Prerequisites: CMC203 Properties of Engineering Materials</i></p> <p>Mineral binding materials {Lime, Gypsum & Cement} - Concrete aggregates - Building Rocks - Steel reinforcement – Steel reinforcement - Bricks - Fiber – timber.</p> <p><i>Text Book</i></p> <p>Construction Materials, Methods and Techniques by William P. Spence, Delmar Cengage Learning, 4th Edition, 2016</p>
<p>CMC 205 Construction Engineering Drawings 2 (1, 2, 0)</p> <p><i>Prerequisites: FRM109 Engineering Graphics</i></p> <p>Introduction to construction engineering as related to municipal and regional projects. A brief review of the construction industry. Site layout, erection of steel and concrete structures. Drawing to demonstrate the concepts of various types of civil engineering and construction projects which include: residential and industrial buildings, water resources projects, urban transportation systems, coastal development projects, and environmental protection projects. Design and construction drawing which include architectural systems, structural systems, mechanical and electrical installation .Field trips and analysis of local construction projects.</p>

Text Book

Building Construction Illustrated by Francis D. K. Ching, Wiley, 5th Edition, 2014

CM206 CAD for Civil Engineering**3 (2, 0, 2)**

Prerequisites: CMC 205 Construction Engineering Drawings

Irrigation structures: Earth works, retaining walls, bridges, culverts, siphons, regulators, and weirs. Utilities structures: Valve chambers, man holes, settling tanks, filter house, roads intersections. Reinforced concrete structures: footings, column slabs and beams. Steel structures: columns and beams. Drawings of civil and environmental engineering projects, which includes: residential and industrial buildings, water resources projects, urban transportation systems, coastal development projects, and environmental protection projects.

Text Book

A Textbook of Engineering Drawing: Along with an Introduction to AutoCAD, International Publishing House, 2015.

CMC207/UIC205 Surveying for Engineers-1**3 (2, 2, 1)**

Prerequisites: FRB 101 Mathematics I

Measurement systems and equipment- Handling, adjustment, and regular maintenance of Survey equipment. Theodolites and level instruments- principles of measurements; angular measurements; traverse computations and adjustments. Distance measurements, optical (tachometric, substance bar), EDM; area computations and subdivision of plots; spirit and trigonometrical levelling; introduction to triangulation, trilateration, resection, intersection and radiation as methods for provision of controls. Coordinate systems for engineering works: Setting out of engineering works. Areas of irregular objects, Longitudinal sections and cross sections- formation level, calculation of cross-sectional areas- Volumes- the end areas method, the prismatic method, volumes of large earthworks. Balance of cut and fill, volumes from contours. Mass haul diagrams cumulative volumes bulking and shrinkage factor correction.

Text Book

Elementary surveying. An introduction to geomatics by Ghilani C.D., Wolf P.R., PH 2011, ISBN 0132554348

CMA208/CCA301 Basic Architectural Engineering**2 (1, 2, 0)**

Prerequisites: FRM109 Engineering Graphics

Role of the architect and other engineers in building construction, Architectural design fundamentals, Building components and materials, Architectural drawing and detailing.

Text Book

Principles and Practice of Engineering by Mark McAfee, ASCE, Second Edition, 2010

CMC209 Concrete Technology**2 (1, 2,0)**

Prerequisites: CMC 204 Construction Materials

Introduction to concrete as a structural material - Mixing water - Concrete manufacture - Properties of fresh concrete - Properties of hardened concrete - Durability of concrete - Mix design methods - Non-destructive testing - Concrete admixtures - Special concretes.

Text Book

Concrete Technology by E. M. Neville, Pearson, Second Edition, 2010.

CMM210 Fundamental of Thermal Engineering	3 (2, 2, 0)
<i>Prerequisites: FRB107Physics I</i>	
Introduction of Thermodynamics, First law of thermodynamics for closed and steady flow open system, applying first law of thermodynamics for engineering systems, Entropy and Second law of thermodynamics, thermal efficiency of heat engines, Refrigeration cycles and heat pumps, COP of refrigerators and heat pump, gas mixture properties, gas-vapor mixtures and air conditioners; air conditioning processes and applications, Modes of heat transfer, Conduction and composite walls, convection, radiation.	
<i>Text Book</i>	
Fundamentals of Thermal-Fluid Sciences, by Yunus Cengel and Robert Turnerm McGraw-Hill Education; 4th edition, 2011.	
CMC301 Hydraulics for Civil Engineers	3 (2, 3, 1)
<i>Prerequisites: FRB107Physics I</i>	
Hydrostatic, hydrostatic applications, pressure forces, flow conservation equation, continuity equation, energy equation (Bernoulli's equation), momentum equation, flow measurements, orifices and weirs, flow in closed conduits, flow in open channels, and flow in pipeline system; pipes in parallel; pipeline network, pumps.	
<i>Text Book</i>	
Hydraulics for Civil Engineers by P. Wynn, ICE Publishing. First Edition, 2014	
CMC302 Water Resources, Irrigation and Drainage	3 (2, 3, 1)
<i>Prerequisites: CMC 301 Hydraulics for Civil Engineers</i>	
Hydrology cycles, rain fall measurements, average rain fall depth consistency check and adjustments of station, records, estimation of missing data, computation of evapo-transpiration and infiltration values. Hydrology of Nile basin. Nile water resources. Major projects constructed on the river Nile and suggested storage projects. Steam flow measurements, Hydrograph analysis, flood routing, storage operations, ground water hydrology. Planning of irrigation and drainage networks, water requirements for irrigation, control and management of irrigation water distribution. Preliminary design of irrigation systems. Design of drainage networks, environmental and economical aspects.	
<i>Text Book</i>	
Water and Wastewater Calculations Manual by Shun Lin, C. Lee, McGraw-Hill Professional, Second Edition, 2007	
CMC303 Structural Analysis-3	3 (2, 3, 0)
<i>Prerequisites: CMC 202 Structural Analysis-2</i>	
Introduction to statically indeterminate structures, Virtual work method, consistent deformation method, Slope deflection Method, Moment distribution method, Influence lines for indeterminate structures, Introduction to Matrix Structural Analysis.	
<i>Text Book</i>	
Structural Analysis by Aslam Kassimali, CL Engineering, Fifth Edition, 2014	
CMC304 Design of R.C. Structures-1	3 (2, 3, 0)
<i>Prerequisites: CMC 202 Structural Analysis-2</i>	
Introduction to Reinforced Concrete, Materials used in reinforced concrete, Mechanical properties of hardened concrete and reinforcing steel, Methods of design, Load factors and material factors, Behavior of reinforced concrete sections subjected to flexure for: untracked	

stage, working stress stage, and ultimate limit state, Design of sections subjected to flexure using both Ultimate Strength Limit state method and Working Stress method, Design of sections for shear, Bond, development length, and reinforcement splices, Design of sections subjected to axial loads – Design of sections under combined flexure and axial compression. Serviceability Limit states (deflection and cracking limit states), Floor systems, Design of solid reinforced concrete one-way and two-way slabs, Design of floor beams, One-way and two-way hollow block slabs

Text Book

Design of Reinforced Concrete by Jack C. McCormac, Russell H. Brown, Wiley, Fifth Edition, 2014

CMC 305 Soil Mechanics

3 (2, 3, 0)

Prerequisites: CMC 204 Construction Materials

Composition and structure of soils. index properties. Soil description and engineering classification. Effective stress. Vertical stresses. Shear strength . Lateral earth pressure. Seepage. Consolidation. Bearing capacity. Slope stability. Experimental determination of soil characteristics; Atterberg limits, Grain size, Compaction. In-situ density, Permeability, Shear strength test, Consolidation Exploration, sampling and in situ soil measurements; Soil report.

Text Book

Soil Mechanics by Braja Das, Oxford University Press, 15th Edition, 2013.

CMC306/UIC307 Surveying for Engineers II

3 (2, 2, 0)

Prerequisites: CMC207 Surveying for Engineers I

Operations in geodesy; spherical excess and Legendre's formula; shape of the earth - ellipsoid geoid, vertical deflection, selection of spheroid; coordinate systems, change of coordinate systems, computations on the spheroid.; Map projections – distortion, conformal mapping, Gaussian fundamental quantities, isometric co-ordinates, transverse Mercator, UTM
Space-based positioning systems (such as GPS and GLONASS) used in conjunction with sophisticated mathematical modeling to solve the problems of determining 3-D position on and near the surface of the earth. GPS system concepts and characteristics, signal structure, receivers and antennae; GPS measurements, GPS time, error sources and measurement accuracy.; position determination techniques - single point and differential positioning, static and kinematic GPS, post mission and Real time processing, DGPS concepts; using GPS for height determination; reference datum and datum transformation.

Text Book

Elementary surveying. An introduction to geomatics by Ghilani C.D., Wolf P.R., PH 2011, ISBN: 0132554348.

CMC307 Building Construction and City Planning

3 (2, 2, 0)

Prerequisites: CMC 204 Construction Materials

Introduction, Aim & Definitions, Building Construction Stages, Wall bearing Structures: Stone construction, Masonry- raw bricks & brick masonry, Vertical circulation element: Stairs detailing, Complementary & finishing materials, Construction building types, Urban, City planning approaches & basic guidelines of the field

Text Book

The Architect's Handbook of Professional Practice, American Institute of Architects, Wiley, 15th Edition, 2013

<p>CMM308 Technical Installations in Buildings</p> <p><i>Prerequisites: CMM210 Fundamental of Thermal Engineering</i></p> <p>Thermal Comfort Heating. Ventilation & Air Conditioning. (HVAC), Central heating & Cooling Systems, Distribution Media, Delivery Devices. Heat and Moisture Transfer in Buildings, Lighting On-site power generation, Normal electrical systems. Special systems. Water supply & Drainage systems, types of fixtures, private sewerage systems, Fire protection systems, Architectural acoustics.</p> <p><u>Text Book</u></p> <p>Building Technology: Mechanical and Electrical Systems- Architecture by Benjamin Stein, John Wiley & Sons, 2010</p>	<p>2 (1, 2, 0)</p>
<p>CMM309 Project Management</p> <p>Project Planning, Scheduling, and control, Project activities and network construction, Critical path method, PERT, Introduction to Resource scheduling, Project Economy. Applications in construction projects and case studies</p> <p><u>Text Book</u></p> <p>A Guide to Project Management Body of Knowledge: PMBOK, by Project Management Institute, 2016</p>	<p>2(2, 0, 0)</p>
<p>CMC401 Design of Metallic Structures-1</p> <p><i>Prerequisites: CMC 202 Structural Analysis-2</i></p> <p>Construction materials, Design criteria and considerations, Design loads of steel structures, Allowable stresses, Design of tension members, Stability of steel structures against lateral loads, Bracing systems, Column buckling, Design of axially compressed members, Design of bracing members, Design of laterally supported beams, Lateral torsional buckling of beams, Design of laterally unsupported beams, Design of beam-columns, Frames and trusses, Design of bolted and welded connections, Column bases.</p> <p><u>Text Book</u></p> <p>Steel Structures Design: ASD/LRFD by Alan Williams, McGraw-Hill Education, First Edition, 2011.</p>	<p>3 (2, 3, 0)</p>
<p>CMC402 Design of Metallic Structures-2</p> <p><i>Prerequisites: CMC401 Design of Metallic Structures-1</i></p> <p>Introduction to cold-formed sections. Design of cold formal sections. Industrial buildings – Cranes – Tall buildings – Long span structures – Introduction to load and resistance factor design and ultimate design. Plastic analysis of Structures. Behavior of steel frames. Design of Plate girders.</p> <p><u>Text Book</u></p> <p>Unified Design of Steel Structures by Louis F. Geschwindner, Wiley, 2 Edition, 2011.</p>	<p>3 (2, 3, 0)</p>
<p>CMC403 Environmental and Sanitary Engineering</p> <p><i>Prerequisites: CMC301 Hydraulics for Civil Engineers</i></p> <p>Sources of pollution, Water resources and characteristics, Water quality, Water collection works, Water purification works, Water distribution works, Sewer systems, Wastewater characteristics, Wastewater treatment works, Wastewater disposal works, Treated wastewater reuse, Industrial wastes.</p> <p><u>Text Book</u></p>	<p>3 (2, 2, 0)</p>

Introduction to Environmental Engineering by Mackenzie Davis, David Cornwell , McGraw-Hill, Fifth Edition, 2012.

CMC404 Design of Hydraulic Structures

3 (2, 3, 0)

Prerequisites: CMC301 Hydraulics for Civil Engineers

Design of water crossing structures (Culverts, Siphons). Hydraulic and Structural design. Design of Weirs and escapes. Design of Regulators and Barrages. Design of navigation locks. Types of dams, design of concrete and earth dams, Spillways of dams. Pump stations

Text Book

Hydraulic Design Handbook by Larry W Mays, McGraw-Hill Professional, First Edition, 1999.

CMC405 Construction Management

2 (1, 2, 0)

Prerequisites: CMM309 Project Management

Introduction to construction management, project life cycle, responsibilities and relationships of construction project partners, management functions, legal organizational structure, contractual relationships, introduction to project planning, introduction to value engineering, safety and health in construction.

Text Book

Successful Construction Project Management by Paul Netscher, CreateSpace Independent Publishing Platform, First Edition, 2014.

CMC406 Environmental Engineering

3 (2, 3, 0)

Prerequisites: CMC403 Environmental and Sanitary Engineering

Introduction to environmental engineering, pollution problems, types of pollution, degrees of Pollution, sources of pollution, surface water pollution, groundwater Pollution, rain Water Pollution, sea & ocean water pollution, air pollution. Soil pollution, pollution control, pollution prevention. Samples conditions, chemical pollutions measuring in water, microbiological & biological pollution measuring in water, chemical pollutions measuring in air, chemical pollutions measuring in soil, microbiological & biological pollution measuring in soil, field pollution monitoring, environmental protection laboratory. Water supply, wastewater systems, solid waste management, air pollution. Solid waste management: collection, handling, separation and treatment, disposal, recycling and reuse. Monitoring and control, noise, air pollution, environmental laws and its applications

Text Book

An Integrated Approach to Environmental Management by Dibyendu Sarkar (Editor), Rupali Datta (Editor), Avinandan Mukherjee (Editor), Robyn Hannigan (Editor), Wiley, 2015.

CMC407 Foundations Engineering

3 (2, 3, 0)

Prerequisites: CMC 305 Soil Mechanics

Slope stability analysis. Retaining structures. Walls for excavation. Slurry trenches and braced-cut systems. Types of foundation and design criteria. Design of shallow foundations and deep foundations, Construction methods. Pile load test. Dewatering and seepage control. Soil stabilization for foundation support.

Text Book

Principles of Foundation Engineering by Braja M. Das, CL Engineering, 8Edition, 2015.

CMC408 Construction Methods**2 (1, 2, 0)**

Design and construction of formwork systems; horizontal construction and formwork. And vertical construction and formwork. Concrete technology; mixing and batching concrete transporting concrete, and placing and compacting concrete. Design and construction of dewatering systems; open sump system, well point system, and deep well system.; Design and construction of shoring systems; procedure to construct tunnels, roads, and dams. Evaluation and selection of appropriate construction technology, value engineering.

Text Book

Fundamentals of Building Construction by Edward Allen, Joseph Iano, Wiley, Six Edition 2013.

CMC409 Design of R.C. Structures-2**3 (2, 3, 0)**Prerequisites: CMC304 Design of R.C. Structures-1

Paneled beams, Design of slender columns (braced and untraced), Design of simple reinforced concrete frames, Design of slab-type and cantilever-type stairs, Design of reinforced concrete beams subjected to combined shear and torsion. Design of frames, Brackets, Windbags. Structural Systems for tall buildings. Design of multistory frames. Design of concrete water tanks.

Text Book

Reinforced Concrete: Mechanics and Design by James K. Wight, James G. MacGregor, Prentice Hall, Fifth Edition 2008.

CMC410 Slope Stability & Retaining Structures 3 (2, 2, 0)Prerequisites: CMC 305 Soil Mech

Stability analysis of Slopes, Embankments and Dams (Cr = 03) Landslide phenomenon: Types and causes of slope failures, Practical applications; Stability analysis of finite and Infinite slopes, Wedge methods, friction circle method ; Method of slices, Bishop's method, Janbu's method ; Effect of seepage, submerged and sudden draw down conditions ; Design of slopes in cutting, Embankments and Earth dams; Site Investigation: Reconnaissance, Preliminary and detailed investigation, Investigation for foundations ; Advances in stability analysis of slopes. Earth pressure theories, conditions of applicability, arching effect; Retaining walls, Cantilever sheet pile wall; Anchored bulk head, Free and fixed earth support methods, Braced excavation, types, earth pressure, effect of wall rigidity and sequence of construction, Design of wall and wall supports; tunnels and shafts, pressure distribution, design of tunnel lining, methods of tunneling, ground loss.

Text Book

Principles of Foundation Engineering by Braja M. Das, CL Engineering, 8Edition, 2015.

CMC411 Cost Engineering and Quantity Surveying**2 (1, 2, 0)**

Importance of cost engineering, cost estimating, types of estimates, feasibility estimate, budget estimate, detailed estimate, direct cost estimating, quantity take-off, construction resource pricing, indirect costs, general and administrative expenses, risk and contingency estimate, concept of cost monitoring and control, cost breakdown structure, earned value concept, performance indices, cost prediction at completion. Bidding process and requirements, bid documents, construction quantities, take-off principles, methods of measurement, pricing for resources, unit pricing, overheads, writing the bill, measuring and valuation of works during project execution, updating and reporting, construction project exercises

Text Book

Cost Analysis and Estimating for Engineering and Management by Phillip F. Ostwald, Timothy S. McLaren Ph.D. Pearson, 2003.

CMC412 Highway Engineering

3 (2, 2, 0)

Prerequisites: CMC 305 Soil Mechanics

Structural design: Soil classification for, highways, Soil compaction, Drainage of highways and streets. Evaluation of soil strength for design of pavements, Methods of soil stabilization, Design of flexible and rigid pavements, Hot and cold asphaltic concrete, Asphaltic macadam, Maintenance of flexible and rigid pavements. **Geometric design:** Highway classification, Traffic volume, Study and analysis of highways capacity, Design of cross section, sight distances, Vertical alignment of highway, Horizontal alignment of highway, Intersections (at grade and grade separation) Highways and environmental (noise – pollution).

Text Book

Traffic and Highway Engineering by Nicholas J. Garber, Lester A. Hoel, CL Engineering. 5 Edition, 2014.

CMC501 Concrete and Steel Bridges

3 (2, 3, 0)

Prerequisites: CMC409 Design of R.C. Structures-2

Types of bridges, Loads: dead, live, impact, wind and other loadings. Basic design and construction of various types of bridges: truss, beam and plate girder, slab, box girder. Bearing and expansion details.

Text Book

Steel-concrete Composite Bridges by Nicholas J. Garber, Lester A. Hoel, ICE Publishing, 2013.

CMC502 Computer Applications in Civil Engineering

3 (2, 3, 0)

Prerequisites: FRE 102 Computer Programming

Principle of FORTRAN programming. New computer systems (computer network, internet, and operating systems). Computer applications in civil engineering (numerical applications, and engineering applications).

Text Book

Computer Applications in Civil Engineering by Paul D. Spindel, Van Nostrand Reinhold Company.

CMC503 Dynamics of Structures

3 (2, 3, 0)

Prerequisites: CMC 202 Structural Analysis-2

Types of dynamic loads and the formulation of the equation of motion. Single degree of freedom systems, free and forced vibrations of multi degree of freedom systems. Response of structures to earthquakes. Design response spectra for structures, Design criteria for seismic resistant structures, Seismic response of tall buildings.

Text Book

Dynamics of Structures by Anil K. Chopra, Pearson, 4 Edition, 2011.

CMC504 Quality Control, Inspection and Repair of Structures

3 (2, 3, 0)

Prerequisites: CMC 202 Structural Analysis-2

Introduction to quality improvement techniques. Control charts for variables and attributes. Quality systems; ISO 9000, ISO 14000. Total quality management. Maintenance of

structures. Inspection and its related subjects. Deterioration of structures, causes and investigation. Structural behavior and different repair techniques for different structural materials.

Text Book

Concrete and Steel Construction: Quality Control and Assurance by Mohamed A. El-Reedy, CRC press, 2013

CMM506 Equipment for Construction

2 (1, 2, 0)

Prerequisites: CMC408 Construction Methods

Engineering fundamentals of moving earth. Tractors and related equipment; tractors, bulldozers, clearing land, and ripping rock. Scrapers. Excavating equipment; draglines, clamshells, hydraulic excavators, loaders, and trenching machines. Trucks and wagons. Belt conveyor systems. Piles and pile driving equipment. The production of crushed stone aggregate. Cranes; derrick cranes, mobile cranes, and tower cranes.

Text Book

Construction Equipment and Methods: Planning, Innovation, Safety by Leonhard E. Bernold, Wiley, 1 Edition, 2013

CMC509 Project-1

3 (2, 3, 0)

CMC512 Project-2

3 (0, 6, 0)

Topics are selected by groups of students according to their area of interest upon advisor approval. Projects address solution to open ended applications using an integrated engineering approach.

Actual construction projects are selected by groups of students upon advisor approval for analysis. The management and technology aspects of construction are simulated and investigated.

Elective Courses

Elective 1: The student should select one from the following courses:

3 (2, 3, 0)

CMC505 Building Construction

The course introduces basic information about: building systems, wall bearing and skeleton systems, foundations concept, wall and partitions types, ceiling and roofs, damp proofing materials and details, stairs, building opening, services, and finishing materials.

Text Book

Building Construction: Principles, Materials, & Systems by Madan L Mehta Ph.D., Walter Scarborough, Diane Armpriest, Pearson, 2 Edition, 2012

CMC 507 Advanced Engineering Materials

Prerequisites: CMC203 Properties of Engineering Materials, CMC 204 Construction Materials

Polymers and Epoxies, polymers concrete, types, properties and applications of polymers concrete, Fibers, different types, of fibers reinforced concrete, properties, production and applications of fiber reinforced concrete, theory of failure of fiber reinforced concrete, properties of fiber reinforced concrete in compression, tension, bending and shear- Ferro-cement materials, behavior of Ferro-cement under different stresses - Introduction of theories of composite materials, Lightweight aggregate, natural and artificial aggregate, lightweight

concrete, Insulating concrete, structural lightweight concrete, properties of lightweight concrete, design mixes of lightweight concrete, failure theories of lightweight concrete under different stresses, Massing and heavy concrete – Special concrete (Refractory concrete, Non shrinkage concrete), Ceramics, Introduction of Egyptian and International Specifications.

Text Book

Advanced Mechanics of Materials, by Arthur P. Boresi, Richard J. Schmidt, Omar M. Sidebottom, Wiley, 6 Edition, 2013.

CMC509 Special Topics in Structural Analysis

Prerequisites: CMC 202 Structural Analysis-2

Numerical Methods in structural analysis: finite difference method and finite element method. Introduction to Plastic analysis of structures: basics, formation of plastic hinges and failure mechanisms.

Text Book

Advanced Structural Analysis by D. Menon, Alpha Science Intl Ltd, 2009

Elective 2: The student should select one from the following courses: 3 (2, 3, 0)

CMC 511 Techniques of Planning, Scheduling and Project Control

Prerequisites: HS 202 Engineering Economics, , CMC309 Project Management

Project definition and work breakdown structure. Scheduling and control models and techniques such as: AOA, AON, bar charting, line of balance. Resource allocation, and optimal schedules. Documentation and reporting, time and cost control, progress monitoring and evaluation and computer applications.

Text Book

Project Planning, Scheduling, and Control by James Lewis, McGraw-Hill Education, 2010

CMC 513 Construction Management-2

Prerequisites: CMC405 Construction Management

Project procurement. Competitive bidding budgetary control. Preparation of budgets. Type of budget. Classification of costs. The need for cash flow forecasting by contractors. The requirements of forecasting system. Capital lock-up. The factors that affect capital lock-up. Economic assessments. Profitability measures. Inflation. Accuracy of future estimates. Financial modeling. Cost-benefit analysis. Plant acquisition. The financing of plant. Systematic plant selection. Setting hire rates. Plant maintenance.

Text Book

Construction Management by by Kraig Knutson, Clifford J. Schexnayder, Christine Fiori, Richard Mayo, McGraw-Hill Education, 2 Edition 2008

CMC 515 Urban Planning

Prerequisites: CMC307 Building Construction and City Planning

This course examines the evolving structure of cities and the way that cities, suburbs, and metropolitan areas can be designed and developed. International cities studied to see how physical, social, political and economic forces interact to shape and reshape cities over time.

Text Book

Urban Planning by Jordan Yin, W. Paul Farmer, Dummies, 1 Edition, 2012

Elective 3: The student should select one from the following courses: 3 (2, 3, 0)**CMC 508 Transportation & Logistics**

Transport systems and basic definitions- Introduction to transport planning and management - Transport operations and scheduling - Logistics supply chain management - Vehicle routing and scheduling - Cost elements - Private participation in transport logistics - International technical cooperation in transport logistics - computer applications

Text Book

Urban Transportation and Logistics by Eiichi Taniguchi, Tien Fang Fwa, Russell G. Thompson, CRC Press, 1 Edition, 2013

CMC 510 Prefabricated Water and Prestressed Concrete StructuresPrerequisites: CMC 409 Design of RC-Structure 2

Prefabricated concrete: design methods, floor and roof systems, wall panels and construction joints. Concrete water structures: design considerations, water tightness. Construction of circular and rectangular tanks. Prestressed concrete: basic principals, methods and systems of prestressing, partial loss of prestressing, analysis and design for flexural, shear and bearing.

Text Book

Reinforced Concrete: Mechanics and Design by James K. Wight, James G. MacGregor, Prentice Hall, 5 Edition 2008.

CMC 512 Analysis and Design of Composite StructuresPrerequisites: CMC402 Design of Metallic Structures-2

Theory of composite structures. Analysis and design of simple and continuous girders. Effect of secondary stresses due to slip and uplift at the interface of concrete slab and steel beam. Analysis and design of composite connections. Composite columns. Methods of construction

Text Book

Analysis and Design of Steel and Composite Structures by Qing Quan Liang, CRC Press, 1 Edition 2014.

Elective 4: The student should select one from the following courses: 3 (2, 3, 0)**CMC 514 Special Topics in Geotechnical Engineering**Prerequisites: CMC 407 Foundation Engineering.

Foundations on problematic soils, Groundwater movement. Ground water related problems. Underpinning . Bridge foundations. Protection of foundation structures against soils and ground water. Geoenvironmental fundamentals. Fate and transport of contaminants in the subsurface. Treatment and disposal methods of waste. Land disposal. Site remediation and subsurface characterization Containment.

Text Book

Principles of Foundation Engineering by Braja M. Das, CL Engineering, 8Edition, 2015.

CMC 516 Total Quality ManagementPrerequisites: CMC504 Quality Control, Inspection and Repair of Structures

Introduction to quality. Quality improvement techniques. Fundamentals of statistics and probabilities. Control charts for variables and attributes. Lot-by-lot acceptance sampling by attributes. Acceptance sampling systems. Reliability. Cost of poor quality. Total quality management. Computers and quality control.

Text Book

Total Quality Management by Dale H. Besterfield, Carol Besterfield-Michna, Glen Besterfield, Mary Besterfield-Sacre, Prentice Hall , 3 Edition, 2002.

CMC 518 Value Engineering in the Construction Industry

The value concept: history, definitions, application to the construction industry, incentive provisions in construction contracts, factors to be considered, application to design. Value engineering methodology: information phase, speculative phase, analytical phase, proposal phase, and final report phase. Value engineering study procedures: objective, selecting the input required, required documentation, life cycle cost methodology.

Text Book

Value Engineering by Alphonse Dell'Isola, RSMMeans, 1997