كلية الهندسة والعلوم التطبيقية

اللائحة الداخلية

لمرحلة البكالوريوس

الباب التاسع

برنامج هندسة وإدارة البنية التحتية المدنية

اسم البرنامج	هندسة وإدارة البنية التحتية المدنية					
اسم التخصصات	هندسة وإدارة نظم النقل					
	هندسة وإدارة نظم المياه والصرف					
	هندسة وإدارة التشييد					
الكلية	الهندسة والعلوم التطبيقية					
الجامعة	جامعة النيل الأهلية					
عدد ساعات الاتصال	محاضرات	تمارين	معمل			
	154.5	56.3	39.8			
	250.5					
(CH) الساعات المعتمدة	160					
(ECTS) النقاط المعتمدة	270					
عدد المقررات	58					

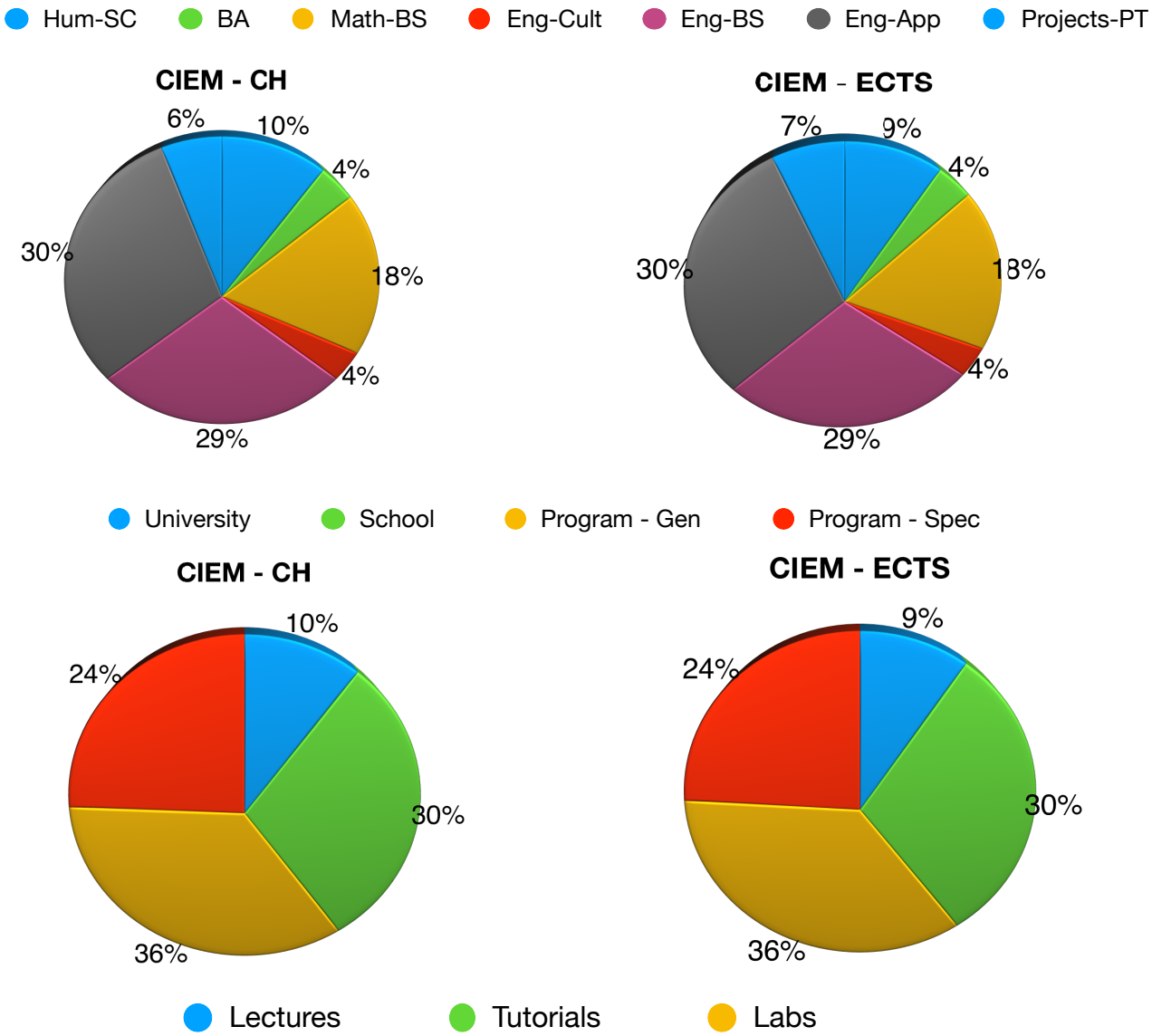
توزيع المقررات طبقاً لمتطلبات مستويات التعلم

	CH	ECTS
متطلبات الجامعة	16	25
متطلبات الكلية	48	82
متطلبات التخصص العام	57	98
متطلبات التخصص الدقيق	39	65

توزيع المقررات طبقاً لفئات المهارات والمعارف

	CH			ECTS		
	Track 1	Track 2	Track 3	Track 1	Track 2	Track 3
العلوم الاجتماعية والانسانية	16	16	19	25	25	30
إدارة الأعمال	5	5	5	9	9	9
الرياضيات والعلوم الأساسية	29	29	29	49	49	49
الثقافة الهندسية	7	7	7	11	11	11
العلوم الهندسية الأساسية	46	46	43	78	78	73
التطبيقات الهندسية والتصميم	48	48	48	80	80	80
المشروعات والتدريب الميداني	9	9	9	18	18	18

بيانات إحصائية



مادة (1): رسالة البرنامج:

يهدف برنامج هندسة وإدارة البنية التحتية المدنية إلى توفير المستوى التعليمى المتميز للطلاب، وتعزيز شراكة وثيقة مع الصناعة، بهدف توفير الخدمات الهندسية المتخصصة لمجتمع التشييد وتطوير البنية التحتية فى مصر وخارجها. ويلتزم البرنامج فى تحقيقه لرسالته بالتحسين المستمر في الجودة الشاملة للتدريس والبحث العلمى والأكاديمى. كما يتحمل البرنامج مسئولية المشاركة فى التقدم العلمى والتكنولوجى فى مجال تخصصه عن طريق توفير الأساس النظرى والعملى والتقنى للطلاب ليسمح لهم بممارسة العمل المهنى والبحثى سواءً كان هذا العمل فى المجتمع الصناعى أو فى المجال الأكاديمى أو فى مراكز البحوث وبحيث يتحول التعليم بالبرنامج إلى نواة صالحة لاستكمال الدراسات العليا على مستوى الماجستير والدكتوراة. كما يتحمل البرنامج المسئولية المهنية لتقديم وسائل التعليم المستمر والتدريب المتخصص للمهندسين العاملين فى مجالات هندسة وإدارة التشييد وتطوير البنية التحتية بهدف تنمية قدراتهم وإكسابهم المهارات اللازمة لتتماشى مع النمو المطرد فى التكنولوجيا الذى يشهده العالم حالياً.

مادة (2): توصيف البرنامج الدراسى بالبرنامج:

تعد الهندسة المدنية نواة للتنمية والنمو الإقتصادي للمجتمعات والدول و تؤثر تقريباً في كل جوانب الحياة. يقدم برنامج هندسة وإدارة البنية التحتية المدنية نموذجاً فريداً في التركيز على الإحتياجات المتنامية في مصر والشرق الأوسط في مجالات متعددة مثل هندسة وإدارة النقل، هندسة وإدارة نظم المياه والصرف، وهندسة وإدارة التشييد، حيث يقدم البرنامج للطلاب رؤية شاملة ومتكاملة في مجال الهندسة المدنية والبنية التحتية من خلال التركيز على الدورة الكاملة لأصول التشييد والبناء والبنية التحتية ويشمل ذلك التخطيط والتصميم والتنفيذ وإدارة المشروعات والتشغيل والصيانة والإدارة الشاملة للأصول طبقاً لأحدث المواصفات وأساليب الإدارة العالمية ليتماشى مع التطور المستمر في العلوم والتكنولوجيا وزيادة الطلب على المهندسيين المدنيين.

وتماشياً مع معدلات التطور فى العلوم والتكنولوجيا الهندسية فإن كلية الهندسية والعلوم التطبيقية بجامعة النيل تقدم برنامج هندسة وإدارة البنية التحتية المدنية بالجامعة والذى يؤدي إلى درجة البكالوريوس في الهندسة المدنية معتمداً نظام الساعات المعتمدة، ويطرح البرنامج المزمع إنشاؤه حالياً ثلاث تخصصات فرعية:

1. هندسة وإدارة نظم النقل.
2. هندسة وإدارة نظم المياه والصرف.
3. هندسة وإدارة التشييد.

ويعتمد برنامج هندسة وإدارة البنية التحتية المدنية على توفير أساس صلب للطلاب في التخصصات التى يقدمها، ويتم التركيز أثناء الدراسة (معتمداً على الأساس العلمى والتكنولوجيى المكتسب) على التطبيقات العملية الحديثة من خلال خطط معملية مدروسة تمكن الطالب من ربط الأساس النظرى بالجانب العملى فى تخصصات البرنامج وذلك عن طريق ربط الدراسة الأكاديمية مع احتياجات سوق العمل.

مادة (3): أهداف البرنامج:

يهدف برنامج هندسة وإدارة البنية التحتية المدنية بكلية العلوم الهندسية بجامعة النيل إلى تحقيق المستوى الأكاديمى والتقنى اللآزم للطلاب ليتواكب مع النمو المطرد فى التكنولوجيا الحديثة فى المجتمعات المتطورة وذلك عن طريق تعليم الطلاب المبادئ الأساسية والتقنيات الحديثة فى مجال تخصصات البرنامج مع تدريب الطلاب على ممارسة المنهجية فى التفكير واستخدام الأساليب الحديثة فى حل المشاكل الهندسية مع دراية شاملة بدور الهندسة المدنية فى نمو وتطوير المجتمعات الحديثة، ولتحقيق هذا فإن البرنامج يهدف إلى أن يكون الخريج:

1. مجهزاً علمياً وتقنياً لممارسة مهنة الهندسة المدنية كمهندس حديث التخرج أو الالتحاق ببرامج دراسات عليا فى مجالات هندسة النقل أو المياه والصرف أو التشييد.

2. قادراً على التعرف على المشاكل الهندسية فى مجالات هندسة وإدارة النقل أو هندسة وإدارة المياه والصرف أو هندسة وإدارة التشييد وتوصيفها بدقة والتعامل معها بمنهجية للوصول إلى الحلول المناسبة وأن يكون قادراً على التواصل مع الآخرين بهذه النتائج.
3. قادراً على التدرج الوظيفى الناجح فى مجال تخصصه (هندسة وإدارة النقل أو هندسة وإدارة المياه والصرف أو هندسة وإدارة التشييد) ليتبوأ المناصب القيادية كنتيجة لتمكنه من مهارات العمل المتكامل مع فريق العمل وقدرات التواصل مع الآخرين ومهارات حل المشاكل الهندسية بأسلوب منهجى.
4. مجهزاً للعمل فى مجالات عريضة فى الهندسة المدنية من خلال اكتسابه العلوم والمهارات التقنية فى مجال التخصص الدقيق (هندسة وإدارة النقل أو هندسة وإدارة المياه والصرف أو هندسة وإدارة التشييد) من خلال المقررات الإجبارية والاختيارية وكذلك العلوم والمهارات التقنية فى مجالات التخصص العام من خلال المقررات الإجبارية ومتطلبات برامج الهندسة المدنية بالجامعة.

مادة (4): مواصفات الخريج:

المخرج الرئيسى للبرنامج المقترح هو تخريج جيل من المهندسين المدنيين متخصصين في مجالات مختلفة مثل هندسة وإدارة البنية التحتية للنقل، أو هندسة وإدارة المياه والصرف، أوهندسة وإدارة التشييد، وبصفة عامة يكون الخريج:

1. ملماً بالأساس الرياضى والعلمى والتقنى لحل المشاكل الهندسية فى مجال الهندسة المدنية.
2. قادراً على تصميم وإجراء الاختبارات المتخصصة فى مجال الهندسة المدنية وتحليل بياناتها ونتائجها بصورة منهجية.
3. قادراً على تطبيق العلوم الهندسية المكتسبة وتطويعها لإدارة المشروعات فى مجال الهندسة المدنية.
4. قادراً على العمل بكفاءة وتكامل فى فريق متعدد التخصصات سواءً كانوا فى نفس تخصصه أو فى تخصصات هندسية أو غير هندسية أخرى.
5. مقدراً للجوانب الاجتماعية المحيطة والتى تحكمه أحياناً فى تصميم وإدارة المشروعات والنظم الملائمة للمحيط والمجتمع الذى يعمل فيه فى إطار مجالات الهندسة المدنية المختلفة.
6. قادراً على إستخدام التقنيات الهندسية الحديثة وعلوم الحاسوب والبرمجيات والتواصل شفهياً وكتابةً بمهنية مع المشاركين فى العمل.
7. مقدراً للتعليم والتطور المستمر واكتساب المهارات الجديدة ومواصلة الحصول على درجات علمية أعلى من مرحلة البكالوريوس (للطلبة المتفوقين المتميزين).

وعلى المستوى المتخصص فى مجال هندسة وإدارة نظم النقل يكون:

8. قادراً على تخطيط وتصميم أنظمة النقل المختلفة ودراسة خصائصها المتشعبة والمتداخلة.
9. قادراً على تطبيق العلوم الهندسية المكتسبة لإدارة المشروعات فى مجال أنظمة النقل.
10. 1قادراً على حل المشاكل وتشغيل وصيانة أنظمة النقل القائمة واقتراح حلول ملائمة فنياً واقتصادياً.
11. 1قادراً على تطبيق مبادئ السلامة في تصميم وتشغيل أنظمة النقل المختلفة.

وسيكون الخريج من هذا التخصص مؤهلاً للعمل فى:

- شركات التطوير العقاري.
- المكاتب الاستشارية المحلية والعالمية العاملة في مجال تخطيط وتصميم أنظمة النقل.
- المؤسسات المسؤولة عن تخطيط أنظمة النقل بأنواعها المختلفة (نقل بري – نقل بحري – نقل جوي).
- شركات المقاولات المسؤولة عن تنفيذ وإدارة مشروعات النقل العملاقة مثل شبكات الطرق والمترو والمطارات والموانئ.
- الشركات المسؤولة عن تشغيل وإدارة أنظمة النقل بأنواعها المختلفة (نقل بري – نقل بحري – نقل جوي).

وعلى المستوى المتخصص فى مجال هندسة وإدارة نظم المياه والصرف:

8. قادراً على تخطيط وتصميم شبكات ومحطات المياه ودراسة خصائصها المتشعبة والمتداخلة.
9. قادراً على تطبيق العلوم الهندسية المكتسبة لإدارة المشروعات فى مجال أنظمة المياه والصرف.
10. قادراً على حل المشاكل وتشغيل وصيانة أنظمة المياه والصرف واقتراح حلول ملائمة فنياً واقتصادياً.
11. ملماً بالمستجدات فى تكنواوجيا وأنظمة تنقية وتحلية المياه ومعالجة الصرف.

وسيكون الخريج من هذا التخصص مؤهلاً للعمل فى:

- شركات التطوير العقاري
- المكاتب الاستشارية المحلية والعالمية العاملة في مجال تخطيط وتصميم مشاريع المياه والصرف.
- شركات المقاولات المسؤلة عن تنفيذ وإدارة مشروعات المياه والصرف.
- الشركات المسؤلة عن تشغيل وإدارة أنظمة المياه والصرف.

وعلى المستوى المتخصص فى مجال هندسة وإدارة التشييد يكون:

8. قادراً على تحليل وتصميم وتنفيذ كافة المنشأت الخرسانية والمعدنية بشكل متكامل.
9. قادراً على إدارة مشروعات التشييد بشكل متكامل وحل المشاكل وإقتراح حلول ملائمة فنياً واقتصادياً.
10. يطبق مبادئ السلامة في تصميم وتنفيذ وإدارة مشروعات التشييد المختلفة.
11. ملماً بالمستجدات فى تكنواوجيا وأنظمة البنية التحتية المختلفة.

وسيكون الخريج من هذا التخصص مؤهلاً للعمل فى:

- المكاتب الإستشارية المحلية والعالمية العاملة في مجال تحليل وتصميم المنشأت الخرسانية والمعدنية والإشراف على تنفيذها وإدارة التشييد والبناء.
- شركات المقاولات المسؤولة عن تنفيذ المشروعات الإنشائية بكافة أنواعها ومشروعات البنية التحتية.
- المؤسسات المسؤولة عن تخطيط المدن والمجتمعات العمرانية الجديدة وإدارة تنفيذ مشروعات اللإسكان بأنواعها المختلفة.
- القسم الفني الخاص بشركات التطوير العقاري وشركات الغاز والبترول، إلخ...

مادة (5): المعايير الأكاديمية للبرنامج:

يلتزم البرنامج المقدم بالمعايير الأساسية المقترحة من قبل الهيئة القومية لضمان جودة التعليم والاعتماد كحد أدنى . والمعايير الأكاديمية لبرنامج الهندسة المدنية بتخصصاته الثلاثه يحدد القدرت والجدارات المتوقعة للخريج.

فبالإضافة إلى (**U-Level** Competencies + **A-Level** Competencies) وبالتوافق مع المعايير الأكاديمية المرجعية الوطنية (NARS-2018) فإن خريجي برنامج هندسة وإدارة البنية التحتية المدنية بكلية الهندسة والعلوم التطبيقية بجامعة النيل يتعين أن يكونوا قادرين على تحقيق (**B-Level** Competencies) على النحو التالي:

B-C Level Competencies for Civil Engineering Graduates

B_C (1)	Select appropriate and sustainable technologies for 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 and Fluid Mechanics.
B_C (2)	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.
B_C (3)	Plan and manage construction processes; address construction defects, instability and quality issues; and maintain safety measures in construction and materials.

B_C (4)	Deal with biddings, contracts and financial issues including project insurance and guarantees; and assess environmental impacts of civil engineering projects.

متطلبات التخصصات الفرعية في الهندسة المدنية (هندسة وإدارة نظم النقل)

(Transportation Systems Eng. & Management ARS / **C_{C-TS}- Level** Competencies)

بالإضافة إلى (**U-Level** Competencies + **A-Level** Competencies + **B-Level** Competencies) فإن خريجي برنامج الهندسة المدنية (تخصص هندسة وإدارة نظم النقل) بكلية الهندسة والعلوم التطبيقية بجامعة النيل يتعين أن يكونوا قادرين على تحقيق (**C-Level** Competencies) على النحو التالي:

C-C-TS Level Competencies for Transportation Systems Eng. & Management Graduates

C_{C-TS} (1)	Illustrate principles of transport planning and traffic engineering, including urban transport planning, transport demand prediction models, public transportation improvements, traffic and speed characteristics, and traffic management and control systems.
C_{C-TS} (2)	Design highways and airports pavement mixes, determine capacity of roads and airspace including operation and maintenance.
C_{C-TS} (3)	Analyze railways systems and components including types of diversions and intersections, different types of signals, railways planning, operation, and maintenance.
C_{C-TS} (4)	Analyze maritime transport, planning processes of ports, movement of ships (VTS), including planning, operation, and maintenance.
C_{C-TS} (5)	Integrate logistics and principles of shipping to regulate storage and distribution of goods.
C_{C-TS} (6)	Interpret smart applications and management for decision support in transport systems.

متطلبات التخصصات الفرعية في الهندسة المدنية (هندسة وإدارة نظم المياه والصرف)

(Water & Wastewater Eng. & Management ARS / **C_{C-WS}- Level** Competencies)

بالإضافة إلى (**U-Level** Competencies + **A-Level** Competencies + **B-Level** Competencies) فإن خريجي برنامج الهندسة المدنية (تخصص هندسة وإدارة نظم المياه والصرف) بكلية الهندسة والعلوم التطبيقية بجامعة النيل يتعين أن يكونوا قادرين على تحقيق (**C-Level** Competencies) على النحو التالي:

C-C-WS Level Competencies for Water & Wastewater Eng. & Management Graduates

C_{C-WS} (1)	Illustrate concepts of health and environmental engineering, water supply engineering, water needs, water resources, and water collection methods.
C_{C-WS} (2)	Analyze sources of surface and groundwater pollution, pollution measurement techniques, industrial and domestic sewage discharge methods, and groundwater pollution treatment.
C_{C-WS} (3)	Integrate principles and bases of chemical processes for biological treatment and purification of water and wastewater.
C_{C-WS} (4)	Design and operation of water distribution networks, pipe lines, ground and high reservoirs, water treatment and desalination plants, and pump stations.

$C_{C\text{-}WS}$ (5)	Analyze main processes of operation, management, repair, and maintenance of water treatment plants and networks.
$C_{C\text{-}WS}$ (6)	Analyze main processes of operation, management, repair, and maintenance of water treatment plants and networks.

متطلبات التخصصات الفرعية في الهندسة المدنية (هندسة وإدارة التشييد)

(Construction Eng. & Management ARS / **$C_{C\text{-}CM}$- Level** Competencies)

بالإضافة إلى (**U-Level** Competencies + **A-Level** Competencies + **B-Level** Competencies) فإن خريجي برنامج الهندسة المدنية (تخصص هندسة وإدارة التشييد) بكلية الهندسة والعلوم التطبيقية بجامعة النيل يتعين أن يكونوا قادرين على تحقيق (**C-Level** Competencies) على النحو التالي:

C-C-CM Level Competencies for Construction Engineering & Management Graduates

$C_{C\text{-}CM}$ (1)	Illustrate advanced concepts of construction project management, value and risk management, operations and maintenance, and human resources management.
$C_{C\text{-}CM}$ (2)	Analyze strategic management and engineering economics in construction and infrastructure projects including feasibility studies, decision support, and marketing techniques.
$C_{C\text{-}CM}$ (3)	Utilize advanced construction management techniques in project scheduling, cost estimation, procurement, and tendering.
$C_{C\text{-}CM}$ (4)	Integrate concepts of flexibility and stiffness, theory of finite elements, to solve determinate and indeterminate structures.
$C_{C\text{-}CM}$ (5)	Design, construction, operation, and management of special concrete and steel structures.
$C_{C\text{-}CM}$ (6)	Interpret advanced analytical models for decision support in construction management.

مادة (6): تفاعل البرنامج مع احتياجات السوق:

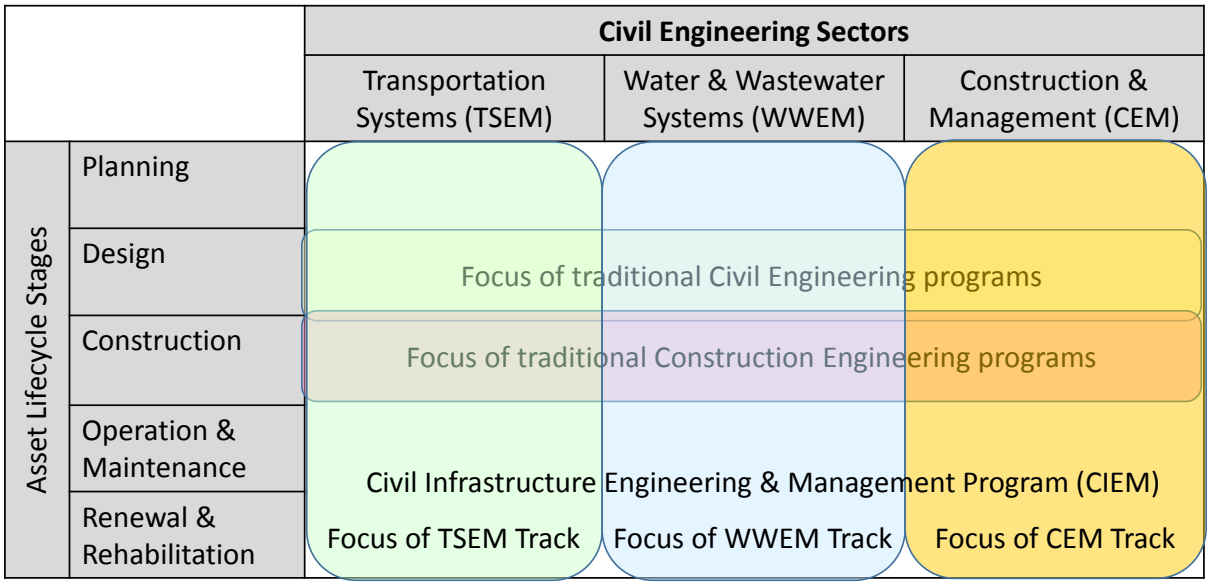
من الأهداف الرئيسية للبرنامج المقترح هو التفاعل المستمر مع احتياجات سوق العمل حيث أن ذلك السوق هو ما يمثل المستهلك الحقيقى لنتاج البرنامج المقترح. وتماشياً مع نظام الجودة الشاملة فإن مخرجات البرنامج لابد وأن تتوافق مع متطلبات المستهلك وعليه فإن الجامعة ملتزمة بالتواصل مع المكاتب الاستشارية وشركات المقاولات وشركات التطوير العقاري والهيئات ذات الصلة بالدولة للتعرف على الاحتياجات الحقيقية للخريجين من البرنامج الجديد وكذلك لتشكيل قنوات مستمرة لتدريب الطلاب فى تلك الجهات. وعليه فإن الجامعة ملتزمة باستضافة ممثلين عن تلك الجهات للتشاور فى مستويات الطلاب المطلوبة وتطوير المقررات الدراسية طبقاً للمستجدات فى سوق العمل.

وتحديداً فيما يخص أفرع البرنامج المقترح (هندسة وإدارة أنظمة النقل وهندسة وإدارة أنظمة المياه والصرف، وهندسة وإدارة التشييد) فقد تم اختيارهم كبداية لتخصصات البرنامج لما يشهده العالم بصفة عامة ومصر ومنطقة الشرق الأوسط بصفة خاصة من نمو مطرد في مشروعات الهندسة المدنية والبنية التحتية سواء كانت في صورة منشأت ومشروعات عمرانية جديدة وما تتطلبة من بنية تحتية في الدول التي تحتاج إلى تنمية وتطوير، أو إحلال وتجديد للمنشأت والبنية التحتية القائمة في الدول الأكثر تطوراً.

مادة (7): التشابه والتمايز عن البرامج المشابهة:

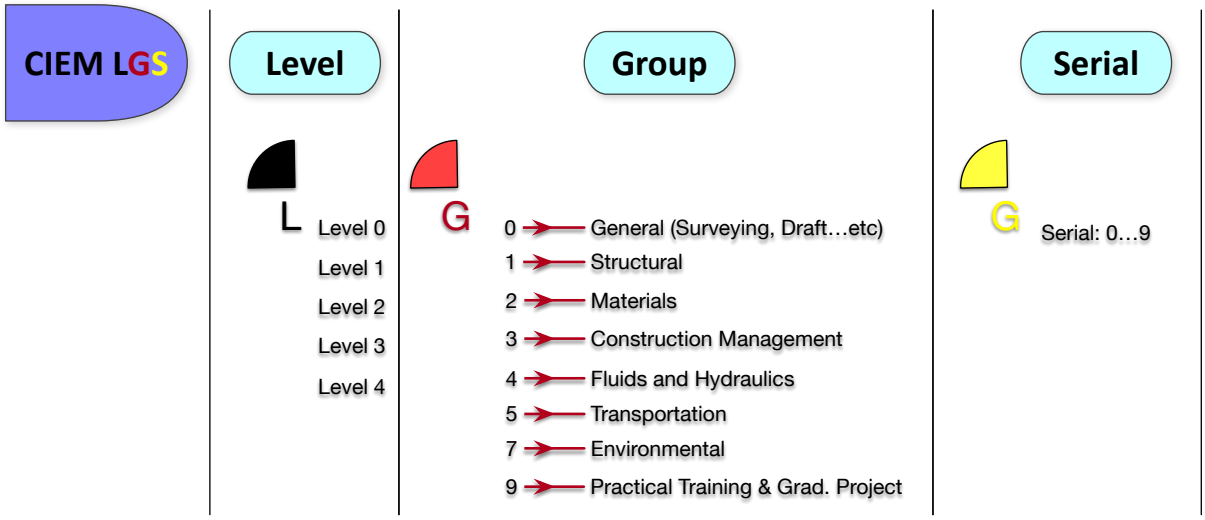
يقدم البرنامج الجديد نموذجاً للأسلوب المنهجى فى التعليم الجامعى فى تخصص هندسة وإدارة أنظمة النقل وأنظمة المياه والصرف وأنظمة التشييد والبناء حيث يستفيد البرنامج من الخبرات المتراكمة فى البرامج المشابهة على المستوى المحلى والمستوى الدولى لتقديم منهج دراسى متكامل يعتمد على:

1. توفير الأساس النظرى المناسب للتخصص بما يواكب ما يتم تدريسه فى الجامعات العريقة محلياً وعالمياً وللبرنامج مكونان أساسيان:
   - تقديم الأساس النظرى والذى يخدم فئة المهندسين المدنيين بصفة عامة لتكوين الأرضية الثابتة للتقدم فى علوم التخصص.
   - تقديم المادة العلمية والعملية التى ترتفع بمستوى الطلاب إلى مستوى التخصص معتمداً على دراسة لما يتم تدريسه بالأقسام المماثلة فى مصر وخارجها.
2. يتمايز البرنامج بكونه يقدم للدارسين رؤية شاملة ومتكاملة في مجال البنية التحتية المدنية من خلال التركيز على الدورة الكاملة لأصول البنية التحتية تشمل التخطيط والتصميم والتنفيذ وإدارة المشروع والتشغيل والصيانة والادارة الشاملة للأصول.
3. يتمايز البرنامج عن البرامج التقليدية للهندسة المدنية في الجامعات المصرية وبرامج هندسة التشييد كما هو موضح بالشكل التالي
4. توفير نظام الساعات المعتمدة –السائد فى جامعة النيل- والذى يتيح للطلبة الاختيار من مجموعة من المقررات للتعمق فى تخصص أكثر دقة من التخصص العام.
5. توفير معامل متكاملة للتطبيقات العملية المصاحبة للدراسة النظرية.
6. توفير خطة تدريب عملى داخل وخارج الجامعة لتتماشى مع متطلبات المقررات الدراسية والتطور المستمر فى احتياجات سوق العمل.



مادة (8): تصميم كود المقررات في برنامج الهندسة الميكانيكية:

تم تصميم كود المقررات في برنامج هندسة وإدارة البنية التحتية المدنية ليتوافق مع نظام تكويد المقررات في جامعة النيل والمتوافق مع توصيات لجنة قطاع التعليم الهندسي بحيث يميز الرقم الثاني من الشق العددي من كود المقرر المجال الدقيق في البرنامج على النحو التالي:



مادة (9): المقررات الدراسية ومدى ملاءمتها لمخرجات البرنامج المستهدفة:

وللحصول على درجة بكالوريوس العلوم في الهندسة المدنية (شعبة هندسة وإدارة نظم النقل - شعبة هندسة وإدارة نظم المياه - شعبة هندسة وإدارة التشييد) ولتحقيق مخرجات التعلم المستهدفة للبرنامج وللتوافق مع قدرات وجدارات الخريج الموصفة من قبل هيئة ضمان الجودة والاعتماد لتخصص Civil Engineering فإنه يتعين على الطالب أن يجتاز بنجاح المقررات التالية المقسمة إلى مستويات (متطلبات الجامعة - متطلبات الكلية - متطلبات التخصص العام - متطلبات التخصص الدقيق).

CIEM University Core Requirements (10 courses = 16 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
ENGL 001	Intensive English	0	0	0	0	0	0	U2
ENGL 002	English I	0	0	0	0	0	50	U2
ENGL 003	English II	0	0	0	0	0	50	U2
ENGL 101	Writing Skills	4.5	0	0	3	5	125	U2
ENGL 102	Communication and Presentation Skills	4.5	0	0	3	5	125	U2
HUMA 001	Introduction to Scientific & Critical Thinking	3	0	0	2	3	75	U3

HUMA 002	Introduction to Ethics	3	0	0	2	3	75	U4
HUMA 003	Selected Topics in Humanities & Arts	3	0	0	2	3	75	U1 U5
SSCI 001	Selected Topics in Social Sciences	3	0	0	2	3	75	U1 U5 U6
SSCI 002	Selected Topics in World Cultures and Diversity	3	3	0	2	3	75	U1 U6
Total Number	**10**	**24**	**3**	**0**	**16**	**25**	**725**	

CIEM Engineering Core Requirements (16 courses = 48 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
CHEM 001	Chemical Principles	3	0	1.5	3	5	125	A1 A2 A4
CSCE 001	Computer & Information Skills	1.5	0	4.5	3	5	125	A1 A10
CSCE 002	Introduction to Programming	1.5	0	4.5	3	5	125	A1 A6 A10
ECEN 101	Electric Circuits	3	0	1.5	3	5	125	A1 A3 A5 A6 A9 A10
ENGR 001	Introduction to Engineering	1.5	0	3	3	5	125	A2 A3 A5 A6 A7
ENGR 002	Introduction to Engineering Design	1.5	0	3	3	5	125	A2 A3 A6 A7 A9
MATH 001	Analytical Geometry & Calculus I	3	1.5	0	3	5	125	A1 A4 A7 A8 A10
MATH 002	Calculus II	3	1.5	0	3	5	125	A1 A2 A5 A7 A8 A10
MATH 103	Probability & Statistics for Engineers	3	1.5	0	3	5	125	A3 A4 A6 A8 A9
MATH 104	Linear Algebra	3	1.5	0	3	5	125	A1 A3 A6 A7 A8
MATH 205	Differential Equations	3	1.5	0	3	5	125	A2 A4 A5 A7 A9 A10
MATH 206	Nummerical Methods	3	1.5	0	3	5	125	A1 A2 A4 A6 A8 A10
MENG 101	Engineering Mechanics I - Statics	3	0	0	2	4	100	A1 A2
MENG 102	Engineering Mechanics II - Dynamics	3	0	0	2	4	100	A1 A2
PHYS 001	Physics I	3	1.5	1.5	4	7	175	A1 A3 A4 A7 A8 A10
PHYS 002	Physics II	3	1.5	1.5	4	7	175	A1 A2 A4 A5 A6 A9
Total Number	**16**	**42**	**12**	**21**	**48**	**82**	**2050**	

CIEM Core Requirements (19 courses = 57 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
CIEM 201	Introduction to Surveying	1.5	1.5	3	3	5	125	A6 A7 B1
CIEM 202	Civil Engineering Drafting	1.5	1.5	3	3	5	125	A6 A8 B1
CIEM 211	Structural Analysis-1	3	1.5	0	3	5	125	A1 B1 B2
CIEM 212	Structural Analysis-2	3	0.75	0.75	3	5	125	A1 B1 B2
CIEM 221	Engineering Materials-1	3	0.75	0.75	3	5	125	A2 B1 B3
CIEM 231	Construction Project Management	3	1.5	1.5	3	5	125	A4 A6 B3
CIEM 311	Reinforced Concrete Design-1	3	1.5	0	3	5	125	A3 A4 B2
CIEM 312	Soil Mechanics	3	1.5	1.5	3	5	125	A2 B1 B2
CIEM 314	Reinforced Concrete Design-2	3	1.5	1.5	3	5	125	A3 A4 B2
CIEM 315	Structural Steel Design	3	1.5	0	3	5	125	A3 A4 B2
CIEM 321	Engineering Materials-2	3	1.5	1.5	3	5	125	A2 B1 B3
CIEM 331	Construction Engineering and Methods	3	1.5	0	3	5	125	A3 B1 B3
CIEM 341	Fluid Mechanics	3	1.5	1.5	3	5	125	A1 B1 B2
CIEM 391	Practical Training	0	0	0	3	6	150	A6 A7 B3
CIEM 411	Design and Construction of Foundations	3	0.75	0.75	3	5	125	A3 A4 B2
CIEM 441	Fundamentals of Hydraulic Engineering	3	1.5	1.5	3	5	125	A2 B1 B2
CIEM 451	Introduction to Transportation and Highway Engineering	3	0.75	0.75	3	5	125	A3 B2 B3
CIEM 493	Graduation Project I	3	0	0	3	6	180	A5 A7 A8 A9 A 10 B2
CIEM 495	Graduation Project II	3	0	0	3	6	180	A5 A7 A8 A9 A 10 B2
Total Number	**19**	**51**	**21**	**18**	**57**	**98**	**2510**	

CIEM Specialization (Track 1) (13 courses = 39 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
CIEM 313	Geotechnics	3	0.75	0.75	3	5	125	A2 B1 B2 C2
CIEM 351	Transportation Planning	3	1.5	0	3	5	125	B2 B3 C1
CIEM 432	Infrastructure Asset Management	3	1.5	0	3	5	125	A4 B3 C2 C3 C4
CIEM 433	Contracts and Commercial Management	3	1.5	0	3	5	125	A6 B4
CIEM 437	Freight and Logistics Management	3	1.5	0	3	5	125	B2 C5 C6
CIEM 452	Traffic Engineering	3	1.5	0	3	5	125	B2 C1 C6
CIEM 453	Public Transit Planning and Operations	3	1.5	0	3	5	125	B2 C2 C3 C4
CIEM 454	Highway Engineering	3	1.5	0	3	5	125	B2 B3 C2
CIEM 456	Maritime and Airport Transit	3	1.5	0	3	5	125	B2 C4 C5 C6
ENTR 301	Selected Topics in Entrepreneurship	1.5	1.5	0	2	4	100	A9 B4 C6
NSCI 102	Selected Topics in Environmental Science	3	3	0	4	6	150	A3 A4 B4 C1
CIEM xxx	Elective-1	3	1.5	0	3	5	150	From list below
CIEM xxx	Elective-2	3	1.5	0	3	5	150	From List below
Total Number	**13**	**37.5**	**20.25**	**0.75**	**39**	**65**	**1675**	

CIEM (Track 1) List of Electives

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
CIEM 333	Civil Engineering Economics	3	1.5	0	3	5	125	B4 C1 C6
CIEM 435	Real Estate & Urban Planning Development	3	1.5	0	3	5	125	B4 C1 C6
CIEM 455	Fundamentals of Intelligent Transportation Systems	3	1.5	0	3	5	125	B2 C1 C6
CIEM 457	Transportation Systems Safety	3	1.5	0	3	5	125	B3 C1 C5
CIEM 458	Design and Operations of Railway Systems	3	1.5	0	3	5	125	B2 C3 C6
CIEM 475	Environmental Assessments of Infrastructure Systems	3	1.5	0	3	5	125	B1 B4 C1
IENG 202	Operations Research I	3	1.5	1.5	3	5	125	C2 C3 C4

CIEM Specialization (Track 2) (13 courses = 39 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
CIEM 333	Civil Engineering Economics	3	1.5	0	3	5	125	B4 C5 C6
CIEM 371	Chemical and Biological Treatment Processes	3	0.75	0.75	3	5	125	B1 C2 C3
CIEM 373	Water Resources Engineering	3	1.5	0	3	5	125	B2 C1 C6
CIEM 412	Design, Construction and Rehabilitation of Water Structures	3	1.5	0	3	5	125	B1 B2 C4
CIEM 433	Contracts and Commercial Management	3	1.5	0	3	5	125	A6 B4 C5
CIEM 471	Design and Operations of Water and Wastewater Treatment Plants	3	1.5	0	3	5	125	B1 B2 C4
CIEM 472	Design, Construction and Operations of Water and Sewer Networks	3	1.5	0	3	5	125	B2 C4 C5
CIEM 473	Design and Operation of Electro-Mechanical Systems	3	1.5	0	3	5	125	B3 C4 C5
CIEM 475	Environmental Assessments of Infrastructure Systems	3	1.5	0	3	5	125	B1 B4 C1
ENTR 301	Selected Topics in Entrepreneurship	1.5	1.5	0	2	4	100	A9 B4 C6
NSCI 102	Selected Topics in Environmental Science	3	3	0	4	6	150	A3 A4 B4 C1
CIEM xxx	Elective-1	3	1.5	0	3	5	150	(from list below)
CIEM xxx	Elective-2	3	1.5	0	3	5	150	(from list below)
Total Number	**13**	**37.5**	**20.25**	**0.75**	**39**	**65**	**1675**	

CIEM (Track 2) List of Electives

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
CIEM 372	Environmental Hydraulics	3	0.75	0.75	3	5	125	B2 B4 C1 C4
CIEM 401	Advanced Surveying & GIS	1.5	1.5	3	3	5	125	B1 C2 C6
CIEM 432	Infrastructure Asset Management	3	1.5	0	3	5	125	A4 B3 C5
CIEM 435	Real Estate & Urban Planning Development	3	1.5	0	3	5	125	B4 C2 C5
CIEM 436	Sustainability & Built Environment	3	1.5	0	3	5	125	A3 B3 C6
CIEM 474	Field Measurement and Water Quality	3	0.75	0.75	3	5	125	B1 C2 C3
IENG 202	Operations Research I	3	1.5	1.5	3	5	125	C1 C4 C5

CIEM Specialization (Track 3) (13 courses = 39 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
CIEM 316	Structural Analysis-3	3	0.75	0.75	3	5	125	B1 C4 C5
CIEM 332	Quantity Surveying, Estimation and Specifications	3	1.5	0	3	5	125	B3 B4 C3
CIEM 333	Civil Engineering Economics	3	1.5	0	3	5	125	B4 C2 C3
CIEM 334	Construction Planning and Scheduling	3	0.75	0.75	3	5	125	B3 C1 C6
CIEM 431	Principles of Management and Human Resources	3	1.5	0	3	5	125	B3 C1 C2
CIEM 432	Infrastructure Asset Management	3	1.5	0	3	5	125	A4 B3 C2 C6
CIEM 433	Contracts and Commercial Management	3	1.5	0	3	5	125	A6 B4 C2
CIEM 434	Strategic Management in Construction	3	1.5	0	3	5	125	B3 B4 C1 C2
CIEM 438	Value and Risk Management in Construction	3	1.5	0	3	5	125	B4 C1 C3
ENTR 301	Selected Topics in Entrepreneurship	1.5	1.5	0	2	4	100	A9 B4 C6
NSCI 102	Selected Topics in Environmental Science	3	3	0	4	6	150	A3 A4 B4 C1
CIEM xxx	Elective-1	3	1.5	0	3	5	150	(from list below)
CIEM xxx	Elective-2	3	1.5	0	3	5	150	(from list below)
Total Number	**13**	**37.5**	**19.5**	**1.5**	**39**	**65**	**1675**	

CIEM (Track 3) List of Electives

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
CIEM 401	Advanced Surveying & GIS	1.5	1.5	3	3	5	125	B1 C3 C6
CIEM 413	Advanced Steel Design	3	1.5	0	3	5	125	B2 C4 C5
CIEM 414	Advanced Concrete Design	3	0.75	0.75	3	5	125	B2 C4 C5
CIEM 435	Real Estate & Urban Planning Development	3	1.5	0	3	5	125	B4 C2 C3
CIEM 436	Sustainability & Built Environment	3	1.5	0	3	5	125	A3 B3 C1
CIEM 439/ ARUD 463	Building Information Modeling	3	3	1.5	3	5	125	B1 B2 C6
IENG 202	Operations Research I	3	1.5	1.5	3	5	125	C1 C5 C6

مادة (10): توزيع مقررات البرنامج على الفئات المقترحة في (NARS):

CIEM Course Mapping to Subject Categories (NARS)

Course Code	Course Title	Hum. & Social Sci.		Business Admin.		Math & Basic Sci.		Eng. Culture		Basic Eng. Sci.		Eng. App. & Design		Project & PT	
		CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS
	University Requirements														
ENGL 001	Intensive English														
ENGL 002	English I	0	0												
ENGL 003	English II	0	0												
ENGL 101	Writing Skills	3	5												
ENGL 102	Communication and Presentation Skills	3	5												
HUMA 001	Introduction to Scientific & Critical Thinking	2	3												
HUMA 002	Introduction to Ethics	2	3												
HUMA 003	Selected Topics in Humanities & Arts	2	3												
SSCI 001	Selected Topics in Social Sciences	2	3												
SSCI 002	Selected Topics in World Cultures and Diversity	2	3												
	Total University Requirements	**16**	**25**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Engineering Requirements														
CHEM 001	Chemical Principles					3	5								
CSCE 001	Computer & Information Skills									3	5				
CSCE 002	Introduction to Programming									3	5				
ECEN 101	Electric Circuits									3	5				
ENGR 001	Introduction to Engineering							3	5						
ENGR 002	Introduction to Engineering Design									3	5				
MATH 001	Analytical Geometry & Calculus I					3	5								
MATH 002	Calculus II					3	5								
MATH 103	Probability & Statistics for Engineers					3	5								
MATH 104	Linear Algebra					3	5								
MATH 205	Differential Equations					3	5								
MATH 206	Nummerical Methods					3	5								
MENG 101	Engineering Mechanics I - Statics									2	4				
MENG 102	Engineering Mechanics II - Dynamics									2	4				
PHYS 001	Physics I					4	7								
PHYS 002	Physics II					4	7								
	Total University Requirements	**0**	**0**	**0**	**0**	**29**	**49**	**3**	**5**	**16**	**28**	**0**	**0**	**0**	**0**
	Program Requirements														
CIEM 201	Introduction to Surveying											3	5		
CIEM 202	Civil Engineering Drafting									3	5				
CIEM 211	Structural Analysis-1									3	5				
CIEM 212	Structural Analysis-2									3	5				
CIEM 221	Engineering Materials-1									3	5				
CIEM 231	Construction Project Management											3	5		
CIEM 311	Reinforced Concrete Design-1											3	5		
CIEM 312	Soil Mechanics									3	5				
CIEM 314	Reinforced Concrete Design-2											3	5		
CIEM 315	Structural Steel Design											3	5		
CIEM 321	Engineering Materials-2											3	5		
CIEM 331	Construction Engineering and Methods									3	5				
CIEM 341	Fluid Mechanics									3	5				
CIEM 391	Practical Training													3	6
CIEM 411	Design and Construction of Foundations											3	5		
CIEM 441	Fundamentals of Hydraulic Engineering									3	5				

Course Code	Course Title	Hum. & Social Sci.		Business Admin.		Math & Basic Sci.		Eng. Culture		Basic Eng. Sci.		Eng. App. & Design		Project & PT	
		CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS
CIEM 451	Introduction to Transportation and Highway Engineering											3	5		
CIEM 493	Graduation Project I													3	6
CIEM 495	Graduation Project II													3	6
	Total Program Requirements	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**24**	**40**	**24**	**40**	**9**	**18**
	Track #1 - Transportation Systems Engineering & Management														
CIEM 313	Geotechnics									3	5				
CIEM 351	Transportation Planning											3	5		
CIEM 432	Infrastructure Asset Management											3	5		
CIEM 433	Contracts and Commercial Management											3	5		
CIEM 437	Freight and Logistics Management			3	5										
CIEM 452	Traffic Engineering											3	5		
CIEM 453	Public Transit Planning and Operations											3	5		
CIEM 454	Highway Engineering									3	5				
CIEM 456	Maritime and Airport Transit											3	5		
CIEM xxx	Elective (1)											3	5		
CIEM xxx	Elective (2)											3	5		
ENTR 301	Selected Topics in Entrepreneurship			2	4										
NSCI 102	Selected Topics in Environmental Science							4	6						
	Total Track 1 Requirements	**0**	**0**	**5**	**9**	**0**	**0**	**4**	**6**	**6**	**10**	**24**	**40**	**0**	**0**
	Total CIEM - Trans. Systems Engineering & Management	**16**	**25**	**5**	**9**	**29**	**49**	**7**	**11**	**46**	**78**	**48**	**80**	**9**	**18**
	Track 1 Course Category %	**10.0%**		**3.1%**		**18.1%**		**4.4%**		**28.8%**		**30.0%**		**5.6%**	
	Track #2 - Water & Wastewater Engineering & Management														
CIEM 333	Civil Engineering Economics			3	5										
CIEM 371	Chemical and Biological Treatment Processes									3	5				
CIEM 373	Water Resources Engineering									3	5				
CIEM 412	Design, Construction and Rehabilitation of Water Structures											3	5		
CIEM 433	Contracts and Commercial Management											3	5		
CIEM 471	Design and Operations of Water and Wastewater Treatment Plants											3	5		
CIEM 472	Design, Construction and Operations of Water and Sewer Networks											3	5		
CIEM 473	Design and Operation of Electro-Mechanical Systems											3	5		
CIEM 475	Environmental Assessments of Infrastructure Systems											3	5		
CIEM xxx	Elective (1)											3	5		
CIEM xxx	Elective (2)											3	5		
ENTR 301	Selected Topics in Entrepreneurship			2	4										
NSCI 102	Selected Topics in Environmental Science							4	6						
	Total Track 2 Requirements	**0**	**0**	**5**	**9**	**0**	**0**	**4**	**6**	**6**	**10**	**24**	**40**	**0**	**0**
	Total CIEM - Water & Wastewater Eng. & Mgmt.	**16**	**25**	**5**	**9**	**29**	**49**	**7**	**11**	**46**	**78**	**48**	**80**	**9**	**18**
	Track 2 Course Category %	**10.0%**		**3.1%**		**18.1%**		**4.4%**		**28.8%**		**30.0%**		**5.6%**	
	Track #3 - Construction Engineering & Management														
CIEM 316	Structural Analysis-3									3	5				

Course Code	Course Title	Hum. & Social Sci.		Business Admin.		Math & Basic Sci.		Eng. Culture		Basic Eng. Sci.		Eng. App. & Design		Project & PT	
		CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS
CIEM 332	Quantity Surveying, Estimation and Specifications											3	5		
CIEM 333	Civil Engineering Economics			3	5										
CIEM 334	Construction Planning and Scheduling											3	5		
CIEM 412	Design, Construction and Rehabilitation of Water Structures											3	5		
CIEM 431	Principles of Management and Human Resources	3	5												
CIEM 432	Infrastructure Asset Management											3	5		
CIEM 434	Strategic Management in Construction											3	5		
CIEM 438	Value and Risk Management in Construction											3	5		
CIEM xxx	Elective (1)											3	5		
CIEM xxx	Elective (2)											3	5		
ENTR 301	Selected Topics in Entrepreneurship			2	4										
NSCI 102	Selected Topics in Environmental Science							4	6						
	Total Track 3 Requirements	**3**	**5**	**5**	**9**	**0**	**0**	**4**	**6**	**3**	**5**	**24**	**40**	**0**	**0**
	Total CIEM - Construction Engineering & Management	**19**	**30**	**5**	**9**	**29**	**49**	**7**	**11**	**43**	**73**	**48**	**80**	**9**	**18**
	Track 3 Course Category %	**11.9%**		**3.1%**		**18.1%**		**4.4%**		**26.9%**		**30.0%**		**5.6%**	

		CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS
		Hum. & Social Sci.		Business Admin.		Math & Basic Sci.		Eng. Culture		Basic Eng. Sci.		Eng. App. & Design		Project & PT	

مادة (11): مصفوفة مخرجات المقررات الدراسية ومدى ملاءمتها للمخرجاتها المستهدفة للبرنامج:

CIEM Program Requirements Courses - Competencies matrix

Major Core Requirements		U1	U2	U3	U4	U5	U6	A1	A2	A3	A4	A5	A6	A7	A8	A9	A 10	B1	B2	B3	B4
		Uni. Competencies (U-Level)						Eng. Competencies (A-Level)										Civil. Eng. (B-Level)			
	Program Requirements																				
CIEM 201	Introduction to Surveying												X	X				X			
CIEM 202	Civil Engineering Drafting												X		X			X			
CIEM 211	Structural Analysis-1							X										X	X		
CIEM 212	Structural Analysis-2							X										X	X		
CIEM 221	Engineering Materials-1								X									X		X	
CIEM 231	Construction Project Management										X		X							X	
CIEM 311	Reinforced Concrete Design-1									X	X								X		
CIEM 312	Soil Mechanics								X									X	X		
CIEM 314	Reinforced Concrete Design-2									X	X								X		
CIEM 315	Structural Steel Design									X	X								X		
CIEM 321	Engineering Materials-2								X									X		X	
CIEM 331	Construction Engineering and Methods									X								X		X	
CIEM 341	Fluid Mechanics							X										X	X		
CIEM 391	Practical Training												X	X						X	
CIEM 411	Design and Construction of Foundations									X	X								X		
CIEM 441	Fundamentals of Hydraulic Engineering								X									X	X		
CIEM 451	Introduction to Transportation and Highway Engineering									X									X	X	
CIEM 493	Graduation Project I											X		X	X	X	X		X		
CIEM 495	Graduation Project II											X		X	X	X	X		X		

CIEM (Track 1) Specialization Course - Competencies matrix

Transportation Systems Engineering & Management (Track #1)		U1	U2	U3	U4	U5	U6	A1	A2	A3	A4	A5	A6	A7	A8	A9	A 10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
		Uni. Competencies (U-Level)						Eng. Competencies (A-Level)										Civil. Eng. (B-Level)				Trans. Systems ($C_{C\text{-}TS}$ Level)					
	Specialization (Track 1)																										
CIEM 313	Geotechnics								X									X	X				X				
CIEM 351	Transportation Planning																		X	X		X					
CIEM 432	Infrastructure Asset Management										X									X			X	X	X		
CIEM 433	Contracts and Commercial Management												X								X						X
CIEM 437	Freight and Logistics Management																		X							X	X
CIEM 452	Traffic Engineering																		X			X					X
CIEM 453	Public Transit Planning and Operations																		X				X	X	X		
CIEM 454	Highway Engineering																		X	X			X				
CIEM 456	Maritime and Airport Transit																		X						X	X	X
ENTR 301	Selected Topics in Entrepreneurship															X					X						X
NSCI 102	Selected Topics in Environmental Science									X	X										X	X					
	Electives																										
CIEM 333	Civil Engineering Economics																				X	X					X
CIEM 435	Real Estate & Urban Planning Development																				X	X					X
CIEM 455	Fundamentals of Intelligent Transportation Systems																		X			X					X
CIEM 457	Transportation Systems Safety																			X		X				X	
CIEM 458	Design and Operations of Railway Systems																		X					X			X
CIEM 475	Environmental Assessments of Infrastructure Systems																	X			X	X					
IENG 202	Operations Research I																						X	X	X		
COUNT		0	0	0	0	0	0	3	4	6	6	2	5	4	3	3	2	11	20	10	4	7	5	5	5	4	9

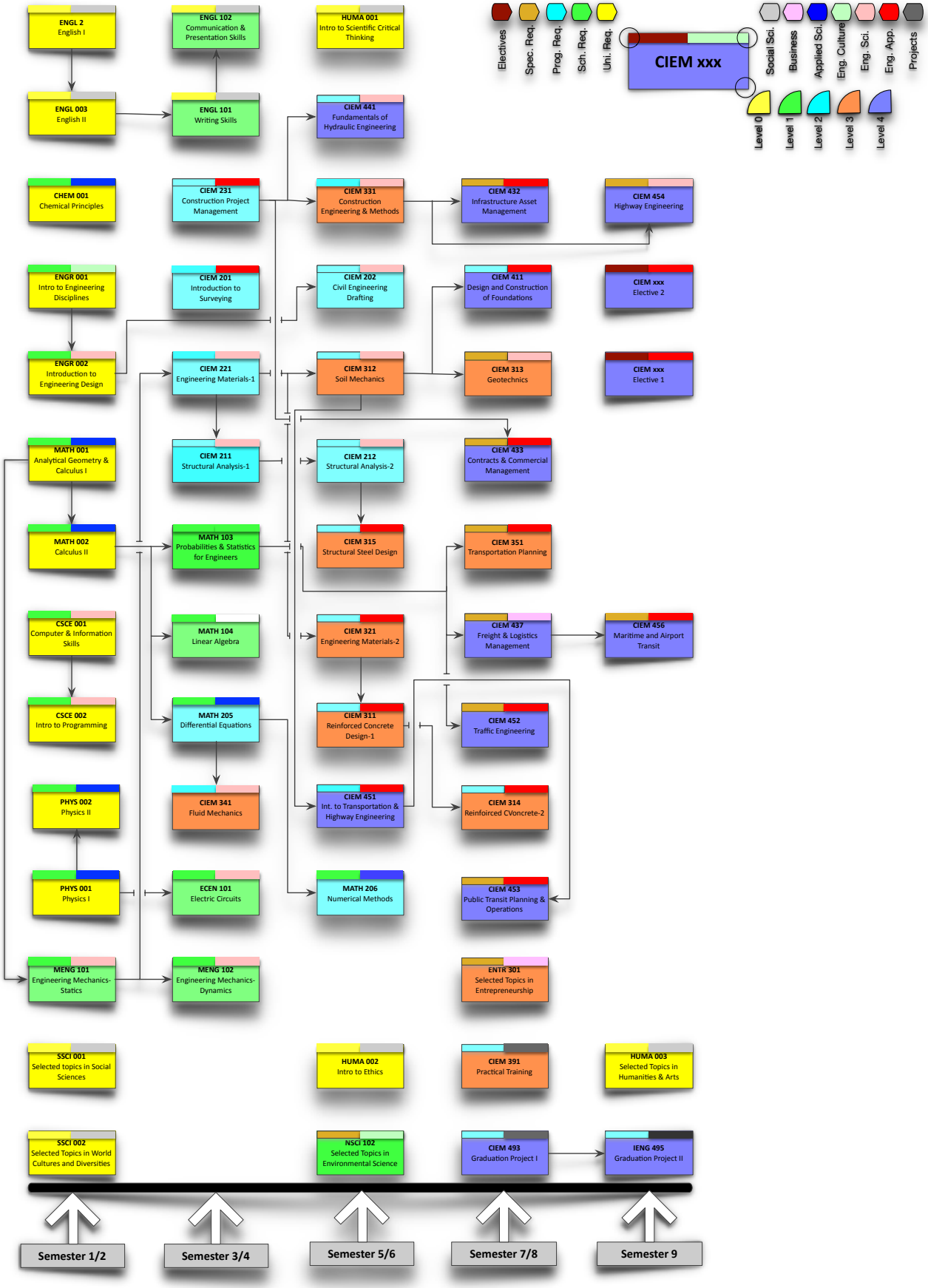
CIEM (Track 2) Specialization Course - Competencies matrix

Water & Wastewater Engineering & Management (Track #2)		U1	U2	U3	U4	U5	U6	A1	A2	A3	A4	A5	A6	A7	A8	A9	A 10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
		Uni. Competencies (U-Level)						Eng. Competencies (A-Level)										Civil. Eng. (B-Level)				Water Systems ($C_{C\text{-}WS}$ Level)					
	Specialization (Track 2)																										
CIEM 333	Civil Engineering Economics																				X					X	X
CIEM 371	Chemical and Biological Treatment Processes																	X					X	X			
CIEM 373	Water Resources Engineering																		X			X					X
CIEM 412	Design, Construction and Rehabilitation of Water Structures																	X	X						X		
CIEM 433	Contracts and Commercial Management												X								X					X	
CIEM 471	Design and Operations of Water and Wastewater Treatment Plants																	X	X						X		
CIEM 472	Design, Construction and Operations of Water and Sewer Networks																		X						X	X	
CIEM 473	Design and Operation of Electro-Mechanical Systems																			X					X	X	
CIEM 475	Environmental Assessments of Infrastructure Systems																	X			X	X					
ENTR 301	Selected Topics in Entrepreneurship															X					X						X
NSCI 102	Selected Topics in Environmental Science									X	X										X	X					
	Electives																										
CIEM 372	Environmental Hydraulics																		X		X	X			X		
CIEM 401	Advanced Surveying & GIS																	X					X				X
CIEM 432	Infrastructure Asset Management										X									X						X	
CIEM 435	Real Estate & Urban Planning Development																				X		X			X	
CIEM 436	Sustainability & Built Environment									X										X							X
CIEM 474	Field Measurement and Water Quality																	X					X	X			
IENG 202	Operations Research I																					X			X	X	
COUNT		0	0	0	0	0	0	3	4	7	5	2	5	4	3	3	2	15	16	8	4	4	4	3	6	6	4

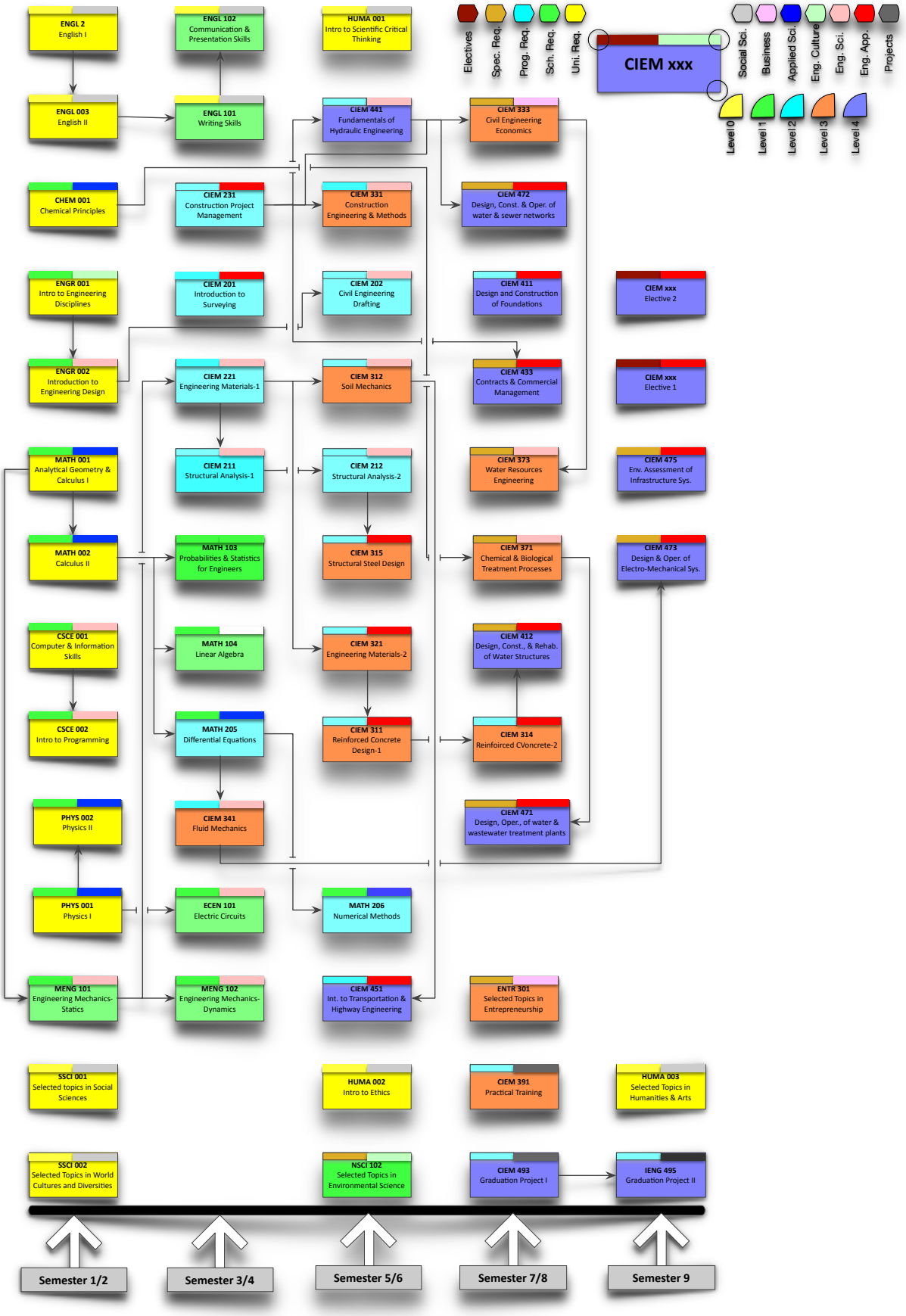
CIEM (Track 3) Specialization Course - Competencies matrix

Construction Engineering & Management (Track #3)		U1	U2	U3	U4	U5	U6	A1	A2	A3	A4	A5	A6	A7	A8	A9	A 10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
		Uni. Competencies (U-Level)						Eng. Competencies (A-Level)										Civil. Eng. (B-Level)				Construction Mgmt ($C_{C\text{-}TS}$ Level)					
	Specialization (Track 3)																										
CIEM 316	Structural Analysis-3																	X							X	X	
CIEM 332	Quantity Surveying, Estimation and Specifications																			X	X			X			
CIEM 333	Civil Engineering Economics																				X		X	X			
CIEM 334	Construction Planning and Scheduling																			X		X					X
CIEM 431	Principles of Management and Human Resources																			X		X	X				
CIEM 432	Infrastructure Asset Management										X									X			X				X
CIEM 433	Contracts and Commercial Management												X								X		X				
CIEM 434	Strategic Management in Construction																			X	X	X	X				
CIEM 438	Value and Risk Management in Construction																				X	X		X			
ENTR 301	Selected Topics in Entrepreneurship															X					X						X
NSCI 102	Selected Topics in Environmental Science									X	X										X	X					
	Electives																										
CIEM 401	Advanced Surveying & GIS																	X						X			X
CIEM 413	Advanced Steel Design																		X						X	X	
CIEM 414	Advanced Steel Design																		X						X	X	
CIEM 435	Real Estate & Urban Planning Development																				X		X	X			
CIEM 436	Sustainability & Built Environment									X										X		X					
CIEM 439/ ARUD 463	Building Information Modeling																	X	X								X
IENG 202	Operations Research I																					X				X	X
COUNT		0	0	0	0	0	0	3	4	7	6	2	5	4	3	3	2	13	15	12	7	7	7	6	4	5	7

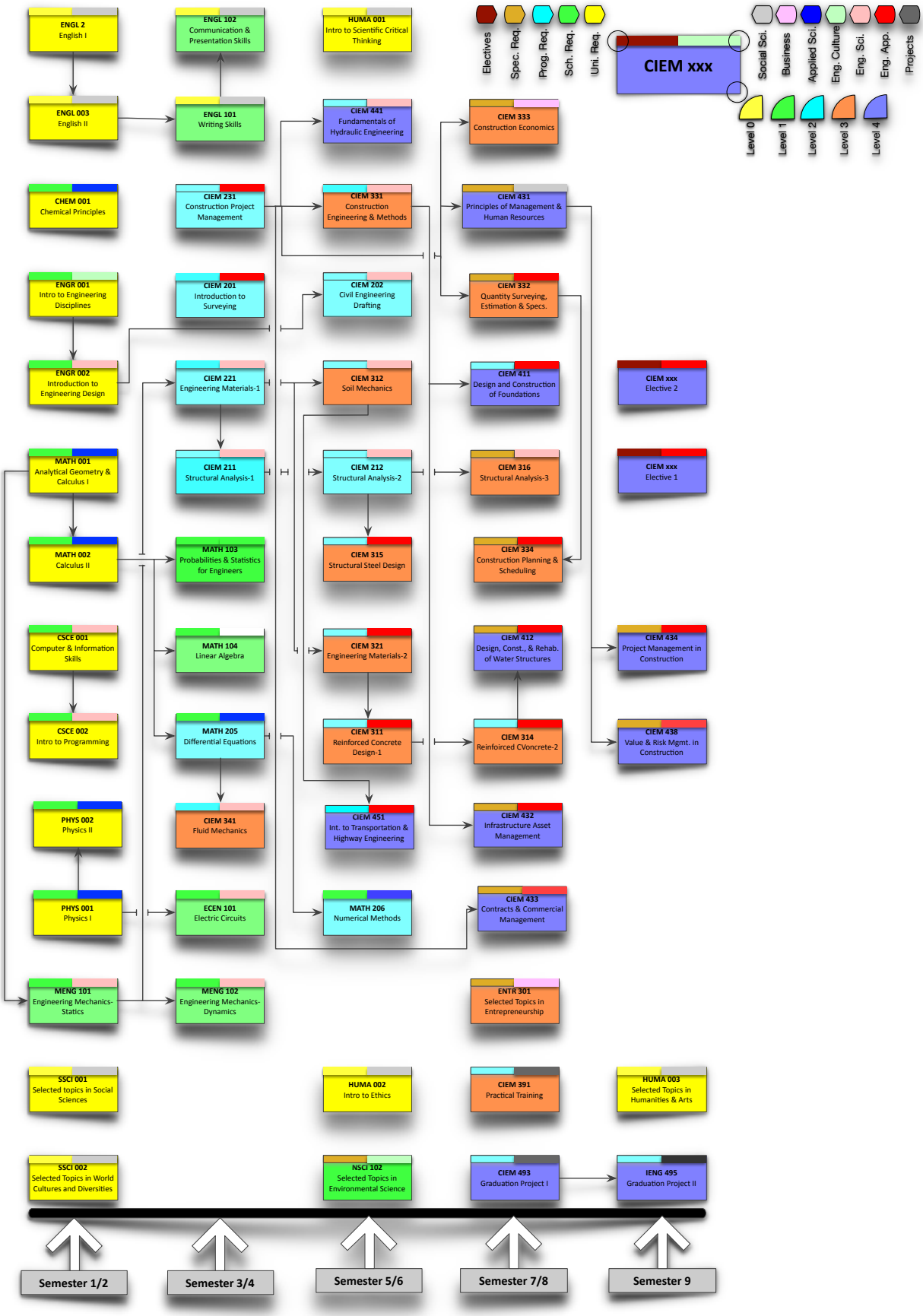
Course Dependency Flow Diagram (Track 1) - Transportation Systems Engineering & Management



Course Dependency Flow Diagram (Track 2) - Water & Wastewater Engineering & Management



Course Dependency Flow Diagram (Track 3) - Construction Engineering & Management



Sample Study Plans

(Track 1) - Transportation Systems Engineering & Management

CIEM (Track 1) Study Plan (Year 1)

	Semester 1						
Code	Title	CH	ECTS	SWL	Prerequisite		
ENGL 002	**English I**	0	0	50	A minimum score of 500 on the TOEFL. Students will also be required to pass a written NU test (essay).		
MATH 001	**Analytical Geometry & Calculus I**	3	5	125	None		
CSCE 001	**Computer & Information Skills**	3	5	125	None		
ENGR 001	**Introduction to Engineering**	3	5	125	None		
CHEM 001	**Chemical Principles**	3	5	125	None		
PHYS 001	**Physics I**	4	7	175	None		
SSCI 001	**Selected Topics in Social Sciences**	2	3	75	None		
TOTAL		**18**	**30**	**800**			
	Semester 2						
ENGL 003	**English II**	0	0	50	ENGL 002 - English I		
MATH 002	**Calculus II**	3	5	125	MATH 001 - Analytical Geometry & Calculus I		
CSCE 002	**Introduction to Programming**	3	5	125	CSCE 001 - Computer & Information Skills		
ENGR 002	**Introduction to Engineering Design**	3	5	125	ENGR 001 - Introduction to Engineering		
MENG 101	**Engineering Mechanics I - Statics**	2	4	100	MATH 001 - Analytical Geometry & Calculus I		
PHYS 002	**Physics II**	4	7	175	PHYS 001 - Physics I		
SSCI 002	**Selected Topics in World Cultures and Diversity**	2	3	75	None		
TOTAL		**17**	**29**	**775**			

CIEM (Track 1) Study Plan (Year 2)

	Semester 3				
Code	**Title**	**CH**	**ECTS**	**SWL**	**Prerequisite**
ENGL 101	**Writing Skills**	3	5	125	ENGL 003 - English II - or IELTS 6.5 or equivalent
MATH 103	**Probability & Statistics for Engineers**	3	5	125	MATH 002 - Calculus II

	Semester 3						
MATH 205	**Differential Equations**	3	5	125	MATH 002 - Calculus II		
MENG 102	**Engineering Mechanics II - Dynamics**	2	4	100	MENG 101 - Engineering Mechanics I - Statics		
CIEM 201	**Introduction to Surveying**	3	5	125	None		
CIEM 221	**Engineering Materials-1**	3	5	125	MENG 101 - Engineering Mechanics I - Statics		
TOTAL		**17**	**29**	**725**			
	Semester 4						
ENGL 102	**Communication and Presentation Skills**	3	5	125	ENGL 101 - Writing Skills		
MATH 104	**Linear Algebra**	3	5	125	MATH 002 - Calculus II		
ECEN 101	**Electric Circuits**	3	5	125	PHYS 001 - Physics I		
CIEM 211	**Structural Analysis-1**	3	5	125	CIEM 221 - Engineering Materials-1		
CIEM 231	**Construction Project Management**	3	5	125	None		
CIEM 341	**Fluid Mechanics**	3	5	125	MATH 205 - Differential Equations		
TOTAL		**18**	**30**	**750**			

CIEM (Track 1) Study Plan (Year 3)

	Semester 5						
Code	**Title**	**CH**	**ECTS**	**SWL**	**Prerequisite**		
MATH 206	**Nummerical Methods**	3	5	125	MATH 205 - Differential Equations		
CIEM 202	**Civil Engineering Drafting**	3	5	125	ENGR 002 - Introduction to Engineering Design		
CIEM 212	**Structural Analysis-2**	3	5	125	CIEM 211 - Structural Analysis-1		
CIEM 312	**Soil Mechanics**	3	5	125	CIEM 221 - Engineering Materials-1		
CIEM 321	**Engineering Materials-2**	3	5	125	CIEM 221 - Engineering Materials-1		
HUMA 001	**Introduction to Scientific & Critical Thinking**	2	3	75	None		
HUMA 002	**Introduction to Ethics**	2	3	75	None		
TOTAL		**19**	**31**	**775**			
	Semester 6						
CIEM 311	**Reinforced Concrete Design-1**	3	5	125	CIEM 321 - Engineering Materials-2	CIEM 321 - Engineering Materials-2	
CIEM 315	**Structural Steel Design**	3	5	125	CIEM 212 - Structural Analysis-2	CIEM 221 - Engineering Materials-1	
CIEM 331	**Construction Engineering and Methods**	3	5	125	CIEM 231 - Construction Project Management		
CIEM 451	**Introduction to Transportation and Highway Engineering**	3	5	125	CIEM 312 - Soil Mechanics		
CIEM 441	**Fundamentals of Hydraulic Engineering**	3	5	125	CIEM 341 - Fluid Mechanics		
NSCI 102	**Selected Topics in Environmental Science**	4	6	150	None		
TOTAL		**19**	**31**	**775**			

CIEM (Track 1) Study Plan (Year 4)

	Semester 7						
Code	**Title**	**CH**	**ECTS**	**SWL**	**Prerequisite**		
CIEM 313	**Geotechnics**	3	5	125	CIEM 312 - Soil Mechanics		
CIEM 314	**Reinforced Concrete Design-2**	3	5	125	CIEM 311 - Reinforced Concrete Design-1		
CIEM 351	**Transportation Planning**	3	5	125	MATH 103 - Probability & Statistics for Engineers		
CIEM 432	**Infrastructure Asset Management**	3	5	125	CIEM 331 - Construction Engineering and Methods		
CIEM 391	**Practical Training**	3	6	150	Completed 6 Semesters		
ENTR 301	**Selected Topics in Entrepreneurship**	2	4	100	None		
TOTAL		**17**	**30**	**750**			
	Semester 8						
CIEM 411	**Design and Construction of Foundations**	3	5	125	CIEM 312 - Soil Mechanics		
CIEM 433	**Contracts and Commercial Management**	3	5	125	CIEM 231 - Construction Project Management		
CIEM 437	**Freight and Logistics Management**	3	5	125	MATH 103 - Probability & Statistics for Engineers		
CIEM 452	**Traffic Engineering**	3	5	125	MATH 103 - Probability & Statistics for Engineers		
CIEM 453	**Public Transit Planning and Operations**	3	5	125	CIEM 351 - Transportation Planning		
CIEM 493	**Graduation Project I**	3	6	180	Senior Standing		
TOTAL		**18**	**31**	**805**			

CIEM (Track 1) Study Plan (Year 5)

	Semester 9							
Code	**Title**	**CH**	**ECTS**	**SWL**	**Prerequisite**			
CIEM 454	**Highway Engineering**	3	5	125	CIEM 331 - Construction Engineering and Methods			
CIEM 456	**Maritime and Airport Transit**	3	5	125	CIEM 437 - Freight and Logistics Management			
CIEM xxx	**Elective (1)**	3	5	125				
CIEM xxx	**Elective (2)**	3	5	125				
CIEM 495	**Graduation Project II**	3	6	180	CIEM 493 - Graduation Project I			
HUMA 003	**Selected Topics in Humanities & Arts**	2	3	75	None			
TOTAL		**17**	**29**	**755**				

CIEM (Track 1) Electives

	Electives				
Code	**Title**	**CH**	**ECTS**	**SWL**	**Prerequisite**
CIEM 333	**Civil Engineering Economics**	3	5	125	CIEM 231 - Construction Project Management
CIEM 435	**Real Estate & Urban Planning Development**	3	5	125	None
CIEM 455	**Fundamentals of Intelligent Transportation Systems**	3	5	125	CIEM 452 - Traffic Engineering
CIEM 457	**Transportation Systems Safety**	3	5	125	CIEM 452 - Traffic Engineering
CIEM 458	**Design and Operations of Railway Systems**	3	5	125	CIEM 453 - Public Transit Planning and Operations
CIEM 475	**Environmental Assessments of Infrastructure Systems**	3	5	125	None
IENG 202	**Operations Research I**	3	5	125	MATH 104 - Linear Algebra

(Track 2) - Water & Wastewater Engineering and Management

CIEM (Track 2) Study Plan (Year 1)

	Semester 1						
Code	Title	CH	ECTS	SWL	Prerequisite		
ENGL 002	**English I**	0	0	50	A minimum score of 500 on the TOEFL. Students will also be required to pass a written NU test (essay).		
MATH 001	**Analytical Geometry & Calculus I**	3	5	125	None		
CSCE 001	**Computer & Information Skills**	3	5	125	None		
ENGR 001	**Introduction to Engineering**	3	5	125	None		
CHEM 001	**Chemical Principles**	3	5	125	None		
PHYS 001	**Physics I**	4	7	175	None		
SSCI 001	**Selected Topics in Social Sciences**	2	3	75	None		
TOTAL		**18**	**30**	**800**			
	Semester 2						
ENGL 003	**English II**	0	0	50	ENGL 002 - English I		
MATH 002	**Calculus II**	3	5	125	MATH 001 - Analytical Geometry & Calculus I		
CSCE 002	**Introduction to Programming**	3	5	125	CSCE 001 - Computer & Information Skills		
ENGR 002	**Introduction to Engineering Design**	3	5	125	ENGR 001 - Introduction to Engineering		
MENG 101	**Engineering Mechanics I - Statics**	2	4	100	MATH 001 - Analytical Geometry & Calculus I		
PHYS 002	**Physics II**	4	7	175	PHYS 001 - Physics I		
SSCI 002	**Selected Topics in World Cultures and Diversity**	2	3	75	None		
TOTAL		**17**	**29**	**775**			

CIEM (Track 2) Study Plan (Year 2)

	Semester 3						
Code	Title	CH	ECTS	SWL	Prerequisite		
ENGL 101	**Writing Skills**	3	5	125	ENGL 003 - English II - or IELTS 6.5 or equivalent		
MATH 103	**Probability & Statistics for Engineers**	3	5	125	MATH 002 - Calculus II		
MATH 205	**Differential Equations**	3	5	125	MATH 002 - Calculus II		
MENG 102	**Engineering Mechanics II - Dynamics**	2	4	100	MENG 101 - Engineering Mechanics I - Statics		
CIEM 201	**Introduction to Surveying**	3	5	125	None		
CIEM 221	**Engineering Materials-1**	3	5	125	MENG 101 - Engineering Mechanics I - Statics		
TOTAL		**17**	**29**	**725**			
	Semester 4						
ENGL 102	**Communication and Presentation Skills**	3	5	125	ENGL 101 - Writing Skills		
MATH 104	**Linear Algebra**	3	5	125	MATH 002 - Calculus II		
ECEN 101	**Electric Circuits**	3	5	125	PHYS 001 - Physics I		
CIEM 211	**Structural Analysis-1**	3	5	125	CIEM 221 - Engineering Materials-1		
CIEM 231	**Construction Project Management**	3	5	125	None		
CIEM 341	**Fluid Mechanics**	3	5	125	MATH 205 - Differential Equations		
TOTAL		**18**	**30**	**750**			

CIEM (Track 2) Study Plan (Year 3)

	Semester 5						
Code	Title	CH	ECTS	SWL	Prerequisite		
MATH 206	**Nummerical Methods**	3	5	125	MATH 205 - Differential Equations		
CIEM 202	**Civil Engineering Drafting**	3	5	125	ENGR 002 - Introduction to Engineering Design		
CIEM 212	**Structural Analysis-2**	3	5	125	CIEM 211 - Structural Analysis-1		
CIEM 312	**Soil Mechanics**	3	5	125	CIEM 221 - Engineering Materials-1		
CIEM 321	**Engineering Materials-2**	3	5	125	CIEM 221 - Engineering Materials-1		
HUMA 001	**Introduction to Scientific & Critical Thinking**	2	3	75	None		
HUMA 002	**Introduction to Ethics**	2	3	75	None		
TOTAL		**19**	**31**	**775**			
	Semester 6						
CIEM 311	**Reinforced Concrete Design-1**	3	5	125	CIEM 321 - Engineering Materials-2	CIEM 321 - Engineering Materials-2	
CIEM 315	**Structural Steel Design**	3	5	125	CIEM 212 - Structural Analysis-2	CIEM 221 - Engineering Materials-1	
CIEM 331	**Construction Engineering and Methods**	3	5	125	CIEM 231 - Construction Project Management		
CIEM 451	**Introduction to Transportation and Highway Engineering**	3	5	125	CIEM 312 - Soil Mechanics		
CIEM 441	**Fundamentals of Hydraulic Engineering**	3	5	125	CIEM 341 - Fluid Mechanics		
NSCI 102	**Selected Topics in Environmental Science**	4	6	150	None		
TOTAL		**19**	**31**	**775**			

CIEM (Track 2) Study Plan (Year 4)

	Semester 7						
Code	Title	CH	ECTS	SWL	Prerequisite		
CIEM 314	**Reinforced Concrete Design-2**	3	5	125	CIEM 311 - Reinforced Concrete Design-1		
CIEM 333	**Civil Engineering Economics**	3	5	125	CIEM 231 - Construction Project Management		
CIEM 371	**Chemical and Biological Treatment Processes**	3	5	125	CHEM 001 - Chemical Principles		
CIEM 373	**Water Resources Engineering**	3	5	125	CIEM 441 - Fundamentals of Hydraulic Engineering		
CIEM 391	**Practical Training**	3	6	150	Completed 6 Semesters		
ENTR 301	**Selected Topics in Entrepreneurship**	2	4	100	None		
TOTAL		**17**	**30**	**750**			
	Semester 8						
CIEM 411	**Design and Construction of Foundations**	3	5	125	CIEM 312 - Soil Mechanics		
CIEM 412	**Design, Construction and Rehabilitation of Water Structures**	3	5	125	CIEM 314 - Reinforced Concrete Design-2		
CIEM 433	**Contracts and Commercial Management**	3	5	125	CIEM 231 - Construction Project Management		
CIEM 471	**Design and Operations of Water and Wastewater Treatment Plants**	3	5	125	CIEM 371 - Chemical and Biological Treatment Processes		
CIEM 472	**Design, Construction and Operations of Water and Sewer Networks**	3	5	125	CIEM 441 - Fundamentals of Hydraulic Engineering		
CIEM 493	**Graduation Project I**	3	6	180	Senior Standing		
TOTAL		**18**	**31**	**805**			

CIEM (Track 2) Study Plan (Year 5)

	Semester 9						
Code	Title	CH	ECTS	SWL	Prerequisite		
CIEM 473	**Design and Operation of Electro-Mechanical Systems**	3	5	125	CIEM 341 - Fluid Mechanics		
CIEM 475	**Environmental Assessments of Infrastructure Systems**	3	5	125	None		
CIEM xxx	**Elective (1)**	3	5	125			
CIEM xxx	**Elective (2)**	3	5	125			
CIEM 495	**Graduation Project II**	3	6	180	CIEM 493 - Graduation Project I		
HUMA 003	**Selected Topics in Humanities & Arts**	2	3	75	None		
TOTAL		**17**	**29**	**755**			

CIEM (Track 2) Electives

	Electives				
Code	Title	CH	ECTS	SWL	Prerequisite
CIEM 372	**Environmental Hydraulics**	3	5	125	CIEM 341 - Fluid Mechanics
CIEM 401	**Advanced Surveying & GIS**	3	5	125	CIEM 201 - Introduction to Surveying
CIEM 432	**Infrastructure Asset Management**	3	5	125	CIEM 331 - Construction Engineering and Methods
CIEM 435	**Real Estate & Urban Planning Development**	3	3	125	None
CIEM 436	**Sustainability & Built Environment**	3	5	125	None
CIEM 474	**Field Measurement and Water Quality**	3	5	125	CIEM 372 - Environmental Hydraulics
IENG 202	**Operations Research I**	3	5	125	MATH 104 - Linear Algebra

(Track 3) - Construction Engineering & Management

CIEM (Track 3) Study Plan (Year 1)

	Semester 1						
Code	Title	CH	ECTS	SWL	Prerequisite		
ENGL 002	**English I**	0	0	50	A minimum score of 500 on the TOEFL. Students will also be required to pass a written NU test (essay).		
MATH 001	**Analytical Geometry & Calculus I**	3	5	125	None		
CSCE 001	**Computer & Information Skills**	3	5	125	None		
ENGR 001	**Introduction to Engineering**	3	5	125	None		
CHEM 001	**Chemical Principles**	3	5	125	None		
PHYS 001	**Physics I**	4	7	175	None		
SSCI 001	**Selected Topics in Social Sciences**	2	3	75	None		
TOTAL		**18**	**30**	**800**			
	Semester 2						
ENGL 003	**English II**	0	0	50	ENGL 002 - English I		
MATH 002	**Calculus II**	3	5	125	MATH 001 - Analytical Geometry & Calculus I		
CSCE 002	**Introduction to Programming**	3	5	125	CSCE 001 - Computer & Information Skills		
ENGR 002	**Introduction to Engineering Design**	3	5	125	ENGR 001 - Introduction to Engineering		
MENG 101	**Engineering Mechanics I - Statics**	2	4	100	MATH 001 - Analytical Geometry & Calculus I		
PHYS 002	**Physics II**	4	7	175	PHYS 001 - Physics I		
SSCI 002	**Selected Topics in World Cultures and Diversity**	2	3	75	None		
TOTAL		**17**	**29**	**775**			

CIEM (Track 3) Study Plan (Year 2)

	Semester 3						
Code	Title	CH	ECTS	SWL	Prerequisite		
ENGL 101	**Writing Skills**	3	5	125	ENGL 003 - English II - or IELTS 6.5 or equivalent		
MATH 103	**Probability & Statistics for Engineers**	3	5	125	MATH 002 - Calculus II		
MATH 205	**Differential Equations**	3	5	125	MATH 002 - Calculus II		
MENG 102	**Engineering Mechanics II - Dynamics**	2	4	100	MENG 101 - Engineering Mechanics I - Statics		
CIEM 201	**Introduction to Surveying**	3	5	125	None		
CIEM 221	**Engineering Materials-1**	3	5	125	MENG 101 - Engineering Mechanics I - Statics		
TOTAL		**17**	**29**	**725**			
	Semester 4						
ENGL 102	**Communication and Presentation Skills**	3	5	125	ENGL 101 - Writing Skills		
MATH 104	**Linear Algebra**	3	5	125	MATH 002 - Calculus II		
ECEN 101	**Electric Circuits**	3	5	125	PHYS 001 - Physics I		
CIEM 211	**Structural Analysis-1**	3	5	125	CIEM 221 - Engineering Materials-1		
CIEM 231	**Construction Project Management**	3	5	125	None		
CIEM 341	**Fluid Mechanics**	3	5	125	MATH 205 - Differential Equations		
TOTAL		**18**	**30**	**750**			

CIEM (Track 3) Study Plan (Year 3)

	Semester 5						
Code	Title	CH	ECTS	SWL	Prerequisite		
MATH 206	**Nummerical Methods**	3	5	125	MATH 205 - Differential Equations		
CIEM 202	**Civil Engineering Drafting**	3	5	125	ENGR 002 - Introduction to Engineering Design		
CIEM 212	**Structural Analysis-2**	3	5	125	CIEM 211 - Structural Analysis-1		
CIEM 312	**Soil Mechanics**	3	5	125	CIEM 221 - Engineering Materials-1		
CIEM 321	**Engineering Materials-2**	3	5	125	CIEM 221 - Engineering Materials-1		
HUMA 001	**Introduction to Scientific & Critical Thinking**	2	3	75	None		
HUMA 002	**Introduction to Ethics**	2	3	75	None		
TOTAL		**19**	**31**	**775**			
	Semester 6						
CIEM 311	**Reinforced Concrete Design-1**	3	5	125	CIEM 321 - Engineering Materials-2	CIEM 321 - Engineering Materials-2	
CIEM 315	**Structural Steel Design**	3	5	125	CIEM 212 - Structural Analysis-2	CIEM 221 - Engineering Materials-1	
CIEM 331	**Construction Engineering and Methods**	3	5	125	CIEM 231 - Construction Project Management		
CIEM 441	**Fundamentals of Hydraulic Engineering**	3	5	125	CIEM 341 - Fluid Mechanics		
CIEM 451	**Introduction to Transportation and Highway Engineering**	3	5	125	CIEM 312 - Soil Mechanics		
NSCI 102	**Selected Topics in Environmental Science**	4	6	150	None		
TOTAL		**19**	**31**	**775**			

CIEM (Track 3) Study Plan (Year 4)

	Semester 7						
Code	Title	CH	ECTS	SWL	Prerequisite		
CIEM 314	**Reinforced Concrete Design-2**	3	5	125	CIEM 311 - Reinforced Concrete Design-1		
CIEM 332	**Quantity Surveying, Estimation and Specifications**	3	5	125	CIEM 231 - Construction Project Management		
CIEM 333	**Civil Engineering Economics**	3	5	125	CIEM 231 - Construction Project Management		
CIEM 432	**Infrastructure Asset Management**	3	5	125	CIEM 331 - Construction Engineering and Methods		
CIEM 391	**Practical Training**	3	6	150	Completed 6 Semesters		
ENTR 301	**Selected Topics in Entrepreneurship**	2	4	100	None		
TOTAL		**17**	**30**	**750**			
	Semester 8						
CIEM 316	**Structural Analysis-3**	3	5	125	CIEM 212 - Structural Analysis-2		
CIEM 334	**Construction Planning and Scheduling**	3	5	125	CIEM 332 - Quantity Surveying, Estimation and Specifications		
CIEM 411	**Design and Construction of Foundations**	3	5	125	CIEM 312 - Soil Mechanics		
CIEM 431	**Principles of Management and Human Resources**	3	5	125	CIEM 231 - Construction Project Management		
CIEM 433	**Contracts and Commercial Management**	3	5	125	CIEM 231 - Construction Project Management		
CIEM 493	**Graduation Project I**	3	6	180	Senior Standing		
TOTAL		**18**	**31**	**805**			

CIEM (Track 3) Study Plan (Year 5)

	Semester 9						
Code	Title	CH	ECTS	SWL	Prerequisite		
CIEM 434	**Strategic Management in Construction**	3	5	125	CIEM 431 - Principles of Management and Human Resources		
CIEM 438	**Value and Risk Management in Construction**	3	5	125	CIEM 431 - Principles of Management and Human Resources		
CIEM xxx	**Elective (1)**	3	5	125			
CIEM xxx	**Elective (2)**	3	5	125			
CIEM 495	**Graduation Project II**	3	6	180	CIEM 493 - Graduation Project I		
HUMA 003	**Selected Topics in Humanities & Arts**	2	3	75	None		
TOTAL		**17**	**29**	**755**			

CIEM (Track 3) Electives

	Electives					
Code	Title	CH	ECTS	SWL	Prerequisite	
CIEM 439/ ARUD 463	**Building Information Modeling**	3	5	125	None	
CIEM 401	**Advanced Surveying & GIS**	3	5	125	CIEM 201 - Introduction to Surveying	
CIEM 413	**Advanced Steel Design**	3	5	125	CIEM 315 - Structural Steel Design	CIEM 316 - Structural Analysis-3
CIEM 414	**Advanced Concrete Design**	3	5	125	CIEM 314 - Reinforced Concrete Design-2	CIEM 316 - Structural Analysis-3
CIEM 435	**Real Estate & Urban Planning Development**	3	5	125	None	
CIEM 436	**Sustainability & Built Environment**	3	5	125	None	
IENG 202	**Operations Research I**	3	5	125	MATH 104 - Linear Algebra	

توصيف مقررات برنامج هندسة وإدارة البنية التحتية المدنية

Color Coding

University Requirements	School Requirements	Program Requirements	Specialization Requirements	Electives Courses

(CIEM) - CIEM 201

Course Title	**Introduction to Surveying**	
Course Code	**CIEM 201**	
Prerequisites	None	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	1.5
	Tutorials	1.5
	Labs	3
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Program Requirements	

Description
The aim of this course is to explore the topics related to principles of plane surveying; methods of measuring distances, angles and differences in heights (levels); traverse computations; setting out horizontal and vertical curves; earthwork computation; setting out engineering structures and construction projects. Introduction to principles of Geographic Information Systems (GIS) for civil engineering.

Lab and Tutorials
This is a practical course that depends on field and lab work where students use the surveying equipment such as total station, theodolite, and GPS for measurements.

Literature
Course Textbook:

- Charles D Ghilani and Paul R Wolf, "Elementary Surveying: An Introduction to Geomatics", Prentice Hall, ISBN: 0-136-154310 (2008).

Additional References:

- Jack C. McCormack, "Surveying", John Wiley & Sons Inc., Hoboken, New Jersey, ISBN: 0-471-237582 (2004).
- Barry F. Kavanagh, "Surveying: Principles and Applications", Prentice Hall, ISBN: 0-131-188623 (2006).

(CIEM) - CIEM 202

Course Title	**Civil Engineering Drafting**	
Course Code	**CIEM 202**	
Prerequisites	ENGR 002 - Introduction to Engineering Design	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	1.5
	Tutorials	1.5
	Labs	3
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description
The aim of this course is to utilize the CAD applications in drafting various civil and infrastructure systems including earthwork, irrigation structures, highways, railways, and reinforced concrete elements such as footing, columns, beams, and slabs; as well as steel elements such as beams, columns, frames, bracing, and connections.

Lab and Tutorials
This is a practical course that depends on computer lab where students use the computer facilities to produce basic civil engineering drawings using AutoCAD 2D.

Literature
Course Textbook:

- Jan A. Van Der Westhuizen, "Drawing for Civil Engineering" Juta & Co. Ltd., ISBN 9780702152122 (2000).

Additional References:

- David A. Madsen, Terence M. Shumaker and David P. Madsen “Civil Drafting Technology, 7th ed.”, Prentice Hall, ISBN: 0135000688 (2010).
- James Leach, "AutoCAD 2007 Instructor With Autodesk Inventor Software 07", McGraw Hill Education, ISBN: 0073319236 (2007),

(CIEM) - CIEM 211

Course Title	**Structural Analysis-1**	
Course Code	**CIEM 211**	
Prerequisites	CIEM 221 - Engineering Materials-1	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description
The aim of this course is to explore the topics related to types of structures, loads, supports and reactions, internal forces, analysis of beams, plane frames and trusses, influence lines of statically determinate structures, and moving loads.

Lab and Tutorials
This is an analytical course that includes tutorial for problem solving.

Literature
Course Textbook:

- Structural Analysis, Aslam Kassimali 5th Edition, ISBN-13: 978-1133943891

Additional References:

- Structural Analysis, R. C. Hibbeler 9th edition, ISBN-13: 978-0133942842
- Fundamentals of Structural Analysis, Kenneth M. Leet et al. 5th edition, ISBN-13: 978-0073398006

(CIEM) - CIEM 212

Course Title	**Structural Analysis-2**	
Course Code	**CIEM 212**	
Prerequisites	CIEM 211 - Structural Analysis-1	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description
The aim of this course is to explore the topics related to stresses and strains in composite sections, stress due to shear and torsion, combined shear and torsion, consistent deformations, three moment equation, moment distribution, deformation of elastic structures using differential equations and virtual work, sway, and buckling of columns.

Lab and Tutorials
This is an analytical course that includes tutorial for problem solving, and 50% computer lab to teach students the use of finite element programs for structural analysis such as SAP2000.

Literature
Course Textbook:

- R. C. Hibbeler, "Structural Analysis 8th Edition in SI Units", Pearson/ Prentice-Hall, ISBN 13: 9780132570534 (2011).

Additional References:

- F. P. Beer, E. R. Johnston, Jr., J. T. Dewolf and D. F. Mazurek, “Mechanics of Materials”, McGraw Hill, ISBN: 978-007-128422-6 (2006).
- K. M. Leet, C-M. Uang and A. M. Gilbert, “Fundamentals of Structural Analysis”, McGraw Hill, ISBN: 978-007-125929-3 (2008).

(CIEM) - CIEM 221

Course Title	**Engineering Materials-1**	
Course Code	**CIEM 221**	
Prerequisites	MENG 101 - Engineering Mechanics I - Statics	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description

The aim of this course is to explore the topics related to construction materials and properties such as concrete, masonry, stone, bricks, steel and timber. Concrete constituent materials including aggregate types and sources, gradation, selection, and testing. Properties of ordinary Portland cement, alternative cements, standard tests for cement, water for concrete mix and admixtures, reinforcement steel properties, grades, size and testing, and an introduction to asphalt mixes.

Lab and Tutorials

This is an analytical course that includes tutorial for problem solving and 50% lab in the materials lab to conduct tests on concrete and other materials.

Literature

Course Textbook:

- Mamlouk and Zaniewski, "Materials for Civil & Construction Engineers", Pearson Prentice Hall, ISBN: 0131477145 (2006).

Additional References:

- Sidney Mindess, J Francis Young and David Darwin, "Concrete", Prentice Hall, ISBN: 0130646326 (2003).
- Neville, A.M., "Properties of Concrete", J. Wiley, ISBN: 0-582-23070-5 (2000).

(CIEM) - CIEM 231

Course Title	**Construction Project Management**	
Course Code	**CIEM 231**	
Prerequisites	None	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Program Requirements	

Description
The aim of this course is to explore the topics related to project management definition, project delivery methods, basic management functions, construction resources, material management, labor productivity, design and analysis of construction operations, construction cost, cost estimating, direct and indirect costs, cash flow, line of balance, and time cost trade-off.

Lab and Tutorials
This is a theoretical course that includes tutorial for discussion and 50% in the computer lab to introduce management software packages such as Primavera.

Literature
Course Textbook:

- Daniel W. Halpin, "Construction Management", John Wiley & Sons Inc., Hoboken, New Jersey, ISBN: 9780471661733 (2005).

Additional References:

- Frederick E. Gould, "Managing the Construction Process: Estimating, Scheduling, and Project Control", Prentice Hall, ISBN: 013113406X (2005).
- John Buttelwerth, "Computer Integrated Construction Project Scheduling", Prentice Hall, ISBN: 0131114654 (2005).

(CIEM) - CIEM 311

Course Title	**Reinforced Concrete Design-1**	
Course Code	**CIEM 311**	
Prerequisites	CIEM 321 - Engineering Materials-2	CIEM 321 - Engineering Materials-2
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Program Requirements	

Description
The aim of this course is to explore the topics related to strength, behavior, and design of reinforced concrete members subjected to moments, shear, and axial forces, emphasis on the influence of the material properties on behavior. Reinforcement details for beams, limit state design, serviceability limit state and deflection.

Lab and Tutorials
This is a design course that includes tutorial for problem solving.

Literature
Course Textbook:

- R. MacGregor, "Reinforced Concrete, Mechanics and Design SI 4th Edition", Pearson Education, ISBN: 9780131976429 (2005)

Additional References:

- Egyptian Code of Practice for the Design of Concrete Structures (2001).
- Structural Eurocodes, British Standards Institute BSI, PP (2007).

(CIEM) - CIEM 312

Course Title	**Soil Mechanics**	
Course Code	**CIEM 312**	
Prerequisites	CIEM 221 - Engineering Materials-1	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description
The aim of this course is to explore the topics related to geology and rock structure, soil phases, soil classification and Atterburg limits, normal stresses, normal stress distribution in soil, shear stress and Mohr's circle, soil shear strength parameters, direct shear testing, one-dimensional consolidation, soil permeability using constant and failing head tests, flow nets.

Lab and Tutorials
This is an analytical course that includes tutorial for problem solving and 50% in the soil mechanics lab for testing.

Literature
Course Textbook:

- Donald P. Coduto, "Geotechnical Engineering: Principles and Practices", Prentice Hall, ISBN: 0-13-5763800 (1999).

Additional References:

- Cheng Liu and Jack Evett, "Soil Properties: Testing, Measurement, and Evaluation", Prentice Hall, ISBN: 0-13-0930059 (2003).
- Michael E. Kalinski, "Soil Mechanics Lab Manual", John Wiley & Sons Inc., Hoboken, New Jersey, ISBN: 0-471-78830-9 (2006).

(CIEM) - CIEM 313

Course Title	**Geotechnics**	
Course Code	**CIEM 313**	
Prerequisites	CIEM 312 - Soil Mechanics	
Classification within the curriculum	Compulsory (Track-1)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to soil compaction, proctor and sand cone testing, CBR, stability of slopes and road embankments using limit equilibrium, site investigation and soil in-situ exploration, dewatering and ground improvement, design of wells in confined and unconfined aquifers, residual strength, soil consolidation under embankments, and long and short term settlements.

Lab and Tutorials
This is an analytical course that includes tutorial for problem solving and 50% in the soil mechanics lab for testing.

Literature
Course Textbook:

- Donald P. Coduto, "Geotechnical Engineering: Principles and Practices", Prentice Hall, ISBN: 0135763800 (1999).

Additional References:

- Cheng Liu and Jack Evett, "Soil Properties: Testing, Measurement, and Evaluation", Prentice Hall, ISBN: 0-13-0930059 (2003).
- Michael E. Kalinski, "Soil Mechanics Lab Manual", John Wiley & Sons Inc., Hoboken, New Jersey, ISBN: 0471788309 (2006).

(CIEM) - CIEM 314

Course Title	**Reinforced Concrete Design-2**	
Course Code	**CIEM 314**	
Prerequisites	CIEM 311 - Reinforced Concrete Design-1	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Program Requirements	

Description

The aim of this course is to explore the topics related to strength, behavior, and design of indeterminate reinforced concrete structures, with primary emphasis on slab systems, emphasis on the strength of slabs and on the available methods of design of slabs spanning in two directions, with or without supporting beams, design of sections under axial forces, design of sections under eccentric forces, design and reinforcement details of concrete columns, development of design drawings for concrete structures.

Lab and Tutorials

This is a design course that includes tutorial for problem solving, and 50% computer lab to teach students the use of finite element programs for structural analysis such as SAP2000.

Literature

Course Textbook:

- R. MacGregor, "Reinforced Concrete, Mechanics and Design SI 4th Edition", Pearson Education, ISBN: 9780131976429 (2005)

Additional References:

- Egyptian Code of Practice for the Design of Concrete Structures (2001).
- Structural Eurocodes, British Standards Institute BSI, PP (2007).

(CIEM) - CIEM 315

Course Title	**Structural Steel Design**	
Course Code	**CIEM 315**	
Prerequisites	CIEM 212 - Structural Analysis-2	CIEM 221 - Engineering Materials-1
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Program Requirements	

Description
The aim of this course is to explore the topics related to design of metal structures, behavior of members and their connections, theoretical, experimental, and practical bases for proportioning members and their connections, design of steel members under different load cases (ASD and LRFD), combined loads, connections, welded and bolted, and moment-resistant connections, and development of detailed design drawings for steel members and connections.

Lab and Tutorials
This is a design course that includes tutorial for problem solving.

Literature
Course Textbook:

- Linden J. Morris and David R. Plum, "Structural Steelwork Design to BS 5950", Prentice Hall, ISBN: 0582230888 (1997).

Additional References:

- Jack C. McCormac "Structural Steel Design 4/E ", Pearson Education, ISBN: 0-13-221816-X (2008).
- Charles G. Salmon, John E. Johnson and Faris A. Malhas "Steel Structures: Design and Behavior (5th Edition)", Prentice Hall, ISBN: 0-13-206119-8 (2009).

(CIEM) - CIEM 316

Course Title	**Structural Analysis-3**	
Course Code	**CIEM 316**	
Prerequisites	CIEM 212 - Structural Analysis-2	
Classification within the curriculum	Compulsory (Track-3)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Basic Engineering Sciences	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to basic concepts of superposition, flexibility, and work and strain energy, analysis of statically indeterminate structures such as trusses, beams, arches, and frames. Topics include determination of element stiffness matrix, transformation of coordinates, structure stiffness matrix and load vector, boundary conditions, and introduction to finite element method.

Lab and Tutorials

This is an analytical course that includes tutorial for problem solving and 50% in the computer lab for modeling.

Literature

Course Textbook:

- R. C. Hibbeler , "Structural Analysis 8th Edition in SI Units", Pearson/ Prentice-Hall, ISBN 13: 9780132570534 (2011)

Additional References:

- J. C. McCormac, “Structural Analysis”, Wiley, ISBN:0-470-03608-7 (2007)

(CIEM) - CIEM 321

Course Title	**Engineering Materials-2**	
Course Code	**CIEM 321**	
Prerequisites	CIEM 221 - Engineering Materials-1	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Program Requirements	

Description

The aim of this course is to explore the topics related to concrete mix design, selection of constituent materials, design of special concrete mix, special additives and admixtures, chemical admixtures and mineral admixtures, cement replacement, fly ash, slag, silica fumes and other materials. This also includes air-entrained concrete, cold and hot weather concreting, durability of concrete, fresh concrete cracks, Sulphate attack, Alkali silica reaction, and fire resistance. Repairing the corrosion of steel reinforcement is also considered, and types of non-destructive tests for concrete.

Lab and Tutorials

This is an analytical course that includes tutorial for problem solving and 50% lab work in the materials lab to conduct tests on concrete and other materials.

Literature

Course Textbook:

- Steven H. Kosmatka, Beatrix Kerkhoff, and William C. Panarese, “Design and Control of Concrete Mixture”, Portland Cement Association, 14th edition, 2003, ISBN 0-89312-217-3

Additional References:

- Neville, A.M., "Properties of Concrete", J. Wiley, ISBN: 0-582-23070-5 (2000)
- P. Kumar Mehta, and Paulo J. M. Monteiro, “Concrete Microstructure Properties and Materials”, Third Edition, McGraw-Hill, 659 pages,, 2006, ISBN 0-07-158919-8.

(CIEM) - CIEM 331

Course Title	**Construction Engineering and Methods**	
Course Code	**CIEM 331**	
Prerequisites	CIEM 231 - Construction Project Management	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Basic Engineering Sciences	
Topics Level	Program Requirements	

Description

The aim of this course is to explore the topics related to building construction systems, concrete and steel systems, slip forming, precast concrete construction, cofferdams, retaining and diaphragm walls construction, construction of wells and dewatering systems, construction methods for roads, pipelines, dams and tunnels, evaluation and selection of appropriate construction technology, construction site layout planning, introduction to types and sizes of equipment, equipment selection factors, and economic principles.

Lab and Tutorials

This is a theoretical course that includes tutorial for discussion on the topic.

Literature

Course Textbook:

- William F. Smith, "Principles of Materials Science and Engineering", McGraw-Hill, ISBN: 0070591695 (1990).

Additional References:

- William D. Callister, “Materials Science and Engineering: An Introduction”, Wiley, ISBN: 0471736961, (2007).
- W. Bolton, "Engineering Materials Technology", Butterworth-Heinemann, ISBN: 0750639172 (1998).

(CIEM) - CIEM 332

Course Title	**Quantity Surveying, Estimation and Specifications**	
Course Code	**CIEM 332**	
Prerequisites	CIEM 231 - Construction Project Management	
Classification within the curriculum	Compulsory (Track-3)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to introduce estimating practices decision to tender, project appreciation, enquiries, quotes and planning, analytical estimating and unit rates, calculating project overheads, completion of estimate and the adjudication process. Course also introduces procurement, tendering, post-contract, and contingency processes, and preparation of BOQ and specifications booklets.

Lab and Tutorials
This is a theoretical course that includes tutorial for discussion on the topic.

Literature
Course Textbook:

- Frederick E. Gould, "Managing the Construction Process: Estimating, Scheduling, and Project Control", Prentice Hall, ISBN: 013113406X (2005).

Additional References:

- Sandra Lee et al., “Willis Elements of Quantity Surveying”, Willey, Blackwell, London, ISBN-10: 1405125632 (2005).

(CIEM) - CIEM 333

Course Title	**Civil Engineering Economics**	
Course Code	**CIEM 333**	
Prerequisites	CIEM 231 - Construction Project Management	
Classification within the curriculum	Compulsory (Track-2 and Track-3) & Elective (Track-1)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Business	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to cost estimation, the concepts of determining the economic feasibility of civil and infrastructure projects, especially the time value of money, interest rates, depreciation, replacement, economic life, present value, rate of return, payback period. Other topics will include financing, supply and demand, economic risk analysis and economic optimization.

Lab and Tutorials
This is an analytical course that includes tutorial for problem solving.

Literature
Course Textbook:

- Myers, D. (2008), Construction Economics: A New Approach, Taylor & Francis.

Additional References:

- Miller, R. L. (2004), Understanding Modern Economics, Prentice Hall.
- McEachern, W.A. (2006) Economics a contemporary approach, Thomson.

(CIEM) - CIEM 334

Course Title	**Construction Planning and Scheduling**	
Course Code	**CIEM 334**	
Prerequisites	CIEM 332 - Quantity Surveying, Estimation and Specifications	
Classification within the curriculum	Compulsory (Track-3)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to define the role of planning in management, developing construction sequences, scheduling construction activities, bar charts, AOA and AON networks, critical path method, construction resources, measuring construction progress, schedule updating, project crashing, and time cost trade-off.

Lab and Tutorials
This is a theoretical course that includes tutorial for discussion and 50% in the computer lab to introduce management software packages such as Primavera.

Literature
Course Textbook:

- Daniel W. Halpin, "Construction Management", John Wiley & Sons Inc., Hoboken, New Jersey, ISBN: 9780471661733 (2005).

Additional References:

- Frederick E. Gould, "Managing the Construction Process: Estimating, Scheduling, and Project Control", Prentice Hall, ISBN: 013113406X (2005).
- John Buttelwerth, "Computer Integrated Construction Project Scheduling", Prentice Hall, ISBN: 0131114654 (2005).

(CIEM) - CIEM 341

Course Title	**Fluid Mechanics**	
Course Code	**CIEM 341**	
Prerequisites	MATH 205 - Differential Equations	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description
The aim of this course is to explore the topics related to fluid statics, conservation of mass, momentum, and energy in fixed and moving control volumes, steady and unsteady Bernoulli's equation, differential analysis of fluid flow, dimensional analysis and similitude, laminar and turbulent flow, boundary layers, lift and drag, applications in civil, infrastructure, and environmental systems.

Lab and Tutorials
This is an analytical course that includes tutorial for problem solving and 50% in the hydraulics lab for demonstration.

Literature
Course Textbook:

- Frank White, “Fluid Mechanics with Student DVD”, McGraw Hill Education, ISBN 9780077422417 (2010).

Additional References:

- Douglas J.F., Gasiorek J.M., Swaffield J.A. and Jack L., "Fluid Mechanics", Prentice Hall, ISBN: 0131292935 (2006).
- Robert L. Mott, “Applied Fluid Mechanics, 6/E”, Pearson Education, ISBN-10: 0131146807 (2006).

(CIEM) - CIEM 351

Course Title	**Transportation Planning**	
Course Code	**CIEM 351**	
Prerequisites	MATH 103 - Probability & Statistics for Engineers	
Classification within the curriculum	Compulsory (Track-1)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	0
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to executing an urban transportation planning study, travel demand modelling, analysis of environmental impacts, modelling transportation-land use interactions and transportation project evaluation, current transportation planning issues and policies, overall process of transportation planning and its role within the wider context of transportation decision-making, planning, and design of urban areas.

Lab and Tutorials
This is a design course that includes tutorial for problem solving.

Literature
Course Textbook:

- Juan de Dios Ortuzar & Luis G. Willumsen, "Modeling Transport, 3rd Edition", John Wiley & Sons Inc., ISBN: 9780471861102 (2001).

Additional References:

- M. G. H. Bell & Yasunori Iida, "Transportation Network Analysis", John Wiley & Sons Inc., ISBN: 9780471964933 (1997).
- Jeffrey Tumlin, “Sustainable Transportation Planning”, John Wiley and Sons, (2011).

(CIEM) - CIEM 371

Course Title	**Chemical and Biological Treatment Processes**	
Course Code	**CIEM 371**	
Prerequisites	CHEM 001 - Chemical Principles	
Classification within the curriculum	Compulsory (Track-2)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Basic Engineering Sciences	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to theory and application of physical and chemical operations and processes for the treatment of water and wastewater, sedimentation, coagulation, filtration, and disinfection, and reactor theory. Topics include theory and application of biological processes for water and waste treatment and the microbiological fundamentals, activated sludge process, biological nutrient removal processes, and anaerobic processes for waste treatment and energy recovery with a focus on design and control of these processes.

Lab and Tutorials

This is an analytical course that includes tutorial for problem solving and 50% in the environmental lab for testing.

Literature

Course Textbook:

- Udo Wiesmann, In Su Choi, Eva-Maria Dombrowski, “Fundamentals of Biological Wastewater Treatment” Wiley, ISBN: 978-3- 527-31219-1 (2006).

Additional References:

- Henze, M., Harremoes, P., Arvin, E., LaCour, J, “Wastewater Treatment: Biological and Chemical Processes”. Springer-Verlag Berlin Heidelberg. DOI 10.1007/978-3-662-22605-6 (1997).

(CIEM) - CIEM 372		
Course Title	**Environmental Hydraulics**	
Course Code	**CIEM 372**	
Prerequisites	CIEM 341 - Fluid Mechanics	
Classification within the curriculum	Elective (Track-2)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Basic Engineering Sciences	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to sources of pollution of surface and ground waters, types and properties of pollutants, evaluation of hazardous effects of pollutants, spread and movement of pollutants in surface and ground waters, motion and mass balance equations, pollution measurement techniques. Topics include environmental impact of hydraulic structures, hydraulic methods of industrial and domestic sewage discharge into water bodies, groundwater pollution and treatment, and water quality control for surface and ground waters.

Lab and Tutorials

This is an analytical course that includes tutorial for problem solving and 50% in the environmental lab for testing.

Literature

Course Textbook:

- Gilbert M. Masters, "Introduction to Environmental Engineering and Science: International Edition, 2/E", Prentice Hall, ISBN: 0138965498 (1998).

Additional References:

- Other articles related to topic.

(CIEM) - CIEM 373

Course Title	**Water Resources Engineering**	
Course Code	**CIEM 373**	
Prerequisites	CIEM 441 - Fundamentals of Hydraulic Engineering	
Classification within the curriculum	Compulsory (Track-2)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Basic Engineering Sciences	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to quantitative aspects of water in the earth's environment and its engineering implications, including design and analysis of systems directly concerned with use and control of water and water resources planning. Topics include non-traditional water resources such as ground water, water extraction using deep wells, water reuse, desalination, and grey water systems. The course also clarifies the demands for each of the studied water resources.

Lab and Tutorials

This is a design course that includes tutorial for problem solving.

Literature

Course Textbook:

- David A. Chin, "Water-Resources Engineering, 2/E", Prentice Hall, ISBN: 0131481924 (2007).

Additional References:

- Metcalf & Eddy, Inc. "Wastewater Engineering: Treatment, Disposal, and Reuse", Fourth edition, McGraw-Hill Companies, Inc., New York, NY, (2003).

(CIEM) - CIEM 391

Course Title	**Practical Training**	
Course Code	**CIEM 391**	
Prerequisites	Completed 6 Semesters	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	
	Tutorials	
	Labs	
	TOTAL	0
EG Credit Hours	3	
ECTS	6	
Student Workload (SWL) / semester	150	
Topic Category	Projects and Practical Training	
Topic Level	Program Requirements	

Description
The aim of this training is to provide on-the-job opportunity to students that help them gain experience in their field, develop an interest in a particular career, and create a network of contacts. Service-learning enriches learning by engaging students in meaningful service to their communities. Students apply academic skills to solving real-world problems and linking their learning with genuine needs.

Lab and Tutorials
This is a practical training where students must spend a full month of non-lecture time (without tutorial or lab) on their internship/service learning activity, then conduct a formal presentation and submit a technical report.

Literature
Course Textbook:

- Relevant Health & Safety Executive (HSE) publications.

Additional References:

- Relevant Occupational Safety & Health Administration (OSHA) publications.

(CIEM) - CIEM 401		
Course Title	**Advanced Surveying & GIS**	
Course Code	**CIEM 401**	
Prerequisites	CIEM 201 - Introduction to Surveying	
Classification within the curriculum	Elective (Track-2 and Track-3)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	1.5
	Tutorials	1.5
	Labs	3
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to GNSS, GPS mapping and survey control, sources and types of errors in measurements, error propagation, survey standards and specifications, acquisition and management of geospatial and thermal data, plane and geodetic coordinate systems and transformations, least square adjustment, and geographic information system (GIS) application in civil engineering.

Lab and Tutorials

This is a practical course that includes field and lab work using GPS, GIS, and other surveying tools.

Literature

Course Textbook:

- Barry F. Kavanagh, "Geomatics", Prentice Hall, ISBN: 0-130-322890 (2002)

Additional References:

- Charles D Ghilani and Paul R Wolf, "Elementary Surveying: An Introduction to Geomatics", Prentice Hall, ISBN: 0-136-154310 (2008)
- Jan Van Sickle, “GPS for Land Surveyors” CRC Press, ISBN: 0-575-040751 (2001)

(CIEM) - CIEM 411

Course Title	**Design and Construction of Foundations**	
Course Code	**CIEM 411**	
Prerequisites	CIEM 312 - Soil Mechanics	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Program Requirements	

Description
The aim of this course is to explore the topics related to design of shallow foundations including isolated and combined footings, strip footings, strap beams, raft foundations, and settlement calculation methods under shallow foundations. Design of deep foundations is also included for small and large diameter bored piles, CFA piles, Micropiles, driven piles using dynamic formulas, and settlement of pile caps and piled rafts. The course also includes an introduction to retaining walls.

Lab and Tutorials
This is a design course that includes tutorial for problem solving and 50% in the computer lab to apply design concepts using finite element programs such as Plaxis 2D.

Literature
Course Textbook:

- MJ Tomlinson, "Foundation Design and Construction, 7/E", Prentice Hall, ISBN: 0130311804 (2001).

Additional References:

- Donald P. Coduto, "Foundation Design: Principles and Practices: International Edition, 2/E", Prentice Hall, (2001).
- Cheng Liu, "Soils and Foundations SI, 6/E", Prentice Hall, ISBN: 0131973088 (2005).

(CIEM) - CIEM 412

Course Title	**Design, Construction and Rehabilitation of Water Structures**	
Course Code	**CIEM 412**	
Prerequisites	CIEM 314 - Reinforced Concrete Design-2	
Classification within the curriculum	Compulsory (Track-2)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to RC cracking limits, design of water tight sections, pipe sections, design of water structures, underground circular and rectangular tanks and swimming pools, elevated circular and rectangular deep and shallow tanks, design of RC water and wastewater treatment facilities, construction considerations and quality assurance for water retaining structures, rehabilitation methods and technologies applicable to water retaining structures, and development of design drawings.

Lab and Tutorials
This is a design course that includes tutorial for problem solving.

Literature
Course Textbook:

- R. MacGregor, "Reinforced Concrete, Mechanics and Design SI 4th Edition", Pearson Education, ISBN: 0131976427 (2005)

Additional References:

- Egyptian Code for the Design of Concrete Structures (ECCS)", Ministry of Housing, Utilities and Urban Communities, Cairo, Egypt., (2001)

(CIEM) - CIEM 413		
Course Title	**Advanced Steel Design**	
Course Code	**CIEM 413**	
Prerequisites	CIEM 315 - Structural Steel Design	CIEM 316 - Structural Analysis-3
Classification within the curriculum	Elective (Track-3)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to the analysis and design of multi-story steel systems, composite sections, beam-column members, bracing systems, failure modes of steel connections, detailing of steel connections, seismic activity and dynamic behavior of structures, earthquake resistant design philosophy, design of earthquakes resistant steel structures, high-rise buildings, and develop of design drawings and details.

Lab and Tutorials
This is a design course that includes tutorial for problem solving.

Literature
Course Textbook:

- Linden J. Morris and David R. Plum, "Structural Steelwork Design to BS 5950", Prentice Hall, ISBN: 0582230888 (1997).

Additional References:

- Jack C. McCormac and James K. Nelson, Jr., "Structural Steel Design: LRFD Method: International Edition", Pearson Education, ISBN: 0131286080 (2003).

(CIEM) - CIEM 414		
Course Title	**Advanced Concrete Design**	
Course Code	**CIEM 414**	
Prerequisites	CIEM 314 - Reinforced Concrete Design-2	CIEM 316 - Structural Analysis-3
Classification within the curriculum	Elective (Track-3)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to design of tall concrete structures, including lateral loads due to wind, lateral load resisting systems, shear walls and RC frames, serviceability limit states, seismic risk and activity, dynamic behavior of structures, earthquake resistant concrete design philosophy, smart structural systems, and advanced 3D numerical modeling of tall structures.

Lab and Tutorials
This is a design course that includes 50% tutorial for problem solving and 50% in the computer lab to simulate tall buildings using SAP2000.

Literature
Course Textbook:

- R. MacGregor, "Reinforced Concrete, Mechanics and Design SI 4th Edition", Pearson Education, ISBN: 0131976427 (2005).

Additional References:

- Egyptian Code for the Design of Concrete Structures (ECCS)", Ministry of Housing, Utilities and Urban Communities, Cairo, Egypt., (2001).

(CIEM) - CIEM 431

Course Title	**Principles of Management and Human Resources**	
Course Code	**CIEM 431**	
Prerequisites	CIEM 231 - Construction Project Management	
Classification within the curriculum	Compulsory (Track-3)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Humanities and Social Sciences	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to nature and evolution of management, managerial environments, problem solving and decision making, organizational structure, design and planning. Topics include managing change, staffing, and human resources management, understanding teams, motivation and rewarding employees, leadership productivity, and TQM with particular emphasis on the construction industry.

Lab and Tutorials

This is a theoretical course that includes tutorial for discussion on the topic.

Literature

Course Textbook:

- Loosemore, M., “Human Resource Management in Construction Projects: Strategic and Operational Approaches”, Taylor & Francis; 1 edition, ISBN-10: 0415261635 (2003).

Additional References:

- Freeman-Bell, G. and Balkwill, J., “Management in Engineering, Principles and Practice” 2nd Ed. London: Prentice hall international Ltd. (1996).

(CIEM) - CIEM 432

Course Title	**Infrastructure Asset Management**	
Course Code	**CIEM 432**	
Prerequisites	CIEM 331 - Construction Engineering and Methods	
Classification within the curriculum	Compulsory (Tracks-1 and Track-3)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to infrastructure asset management frameworks, asset inventory models, condition assessment and rehabilitation of roads, water structures and buildings, infrastructure deterioration modeling, asset valuation, asset risk management, performance measures and level of service models for infrastructure.

Lab and Tutorials
This is a theoretical course that includes tutorial for discussion on the topic.

Literature
Course Textbook:

- Daniel W. Halpin, "Construction Management", John Wiley & Sons Inc., Hoboken, New Jersey, ISBN: 9780471661733 (2005).

Additional References:

- Frederick E. Gould, "Managing the Construction Process: Estimating, Scheduling, and Project Control", Prentice Hall, ISBN: 013113406X (2005).
- John Buttelwerth, "Computer Integrated Construction Project Scheduling", Prentice Hall, ISBN: 0131114654 (2005).

(CIEM) - CIEM 433

Course Title	**Contracts and Commercial Management**	
Course Code	**CIEM 433**	
Prerequisites	CIEM 231 - Construction Project Management	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to legal and business aspects of construction processes and potential liability, post-construction processes, participants in a construction contract, types of contracts, formation principles of a contract, performance or breach of contractual obligations, analysis and comparison of the different kinds of construction contracts, dispute resolution mechanisms, different types of specifications, different forms of contracts utilized in construction, development of business opportunities, profitable management of projects and contracts.

Lab and Tutorials
This is a theoretical course that includes tutorial for discussion on the topic.

Literature
Course Textbook:

- Allan Ashworth, "Contractual Procedures in the Construction Industry", Prentice Hall, ISBN: 0131298275 (2006).

Additional References:

- Stuart H. Bartholomew, "Construction Contracting: Business and Legal Principles, 2/E", Prentice Hall, ISBN: 0130910554 (2002).
- Dennis F. Turner & Alan Turner, "Building Contract Claims and Disputes, 2/E", Longman, ISBN: 0582285119 (2002).

(CIEM) - CIEM 434

Course Title	**Strategic Management in Construction**	
Course Code	**CIEM 434**	
Prerequisites	CIEM 431 - Principles of Management and Human Resources	
Classification within the curriculum	Compulsory (Track-3)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to strategic role of actors in the construction process, client, constructor, competencies, national and international firms, strategic management process, theoretical and practical aspects of strategy formulation. Course also include an overview of the construction and real estate markets, and marketing and promotional strategies in construction.

Lab and Tutorials

This is a theoretical course that includes tutorial for discussion on the topic.

Literature

Course Textbook:

- Langford D., and Male S, “Strategic Management in Construction”. 2nd Ed., Oxford, Blackwell Science: ISBN 0632049995 (2001).

Additional References:

- Preece C., Moodley K., and Smith P., “Construction Business Development”. London, Elsevier: ISBN 0750651091 (2003).

(CIEM) - CIEM 435		
Course Title	**Real Estate & Urban Planning Development**	
Course Code	**CIEM 435**	
Prerequisites	None	
Classification within the curriculum	Elective (All Tracks)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to types of real estate and urban plans and its relationship with infrastructure planning, integrated urban and infrastructure planning approaches, urban form, environmental management considerations in urban planning, mitigating natural hazards in urban planning, types of urban development, building types, planning laws and standards, real estate development processes and considerations, market analysis in real estate development, financial considerations in real estate development.

Lab and Tutorials

This is a theoretical course that includes tutorial for discussion on the topic.

Literature

Course Textbook:

- Thwaits, K., “Urban Sustainability through Environmental Design”, Taylor & Francis, ISBN-10: 041539547X (2008).

Additional References:

- Birkeland, Janis. “Design for Sustainability: A Sourcebook of Integrated, Ecological Solutions” Earthscan, ISBN: 9781849770958 (2002).

(CIEM) - CIEM 436		
Course Title	**Sustainability & Built Environment**	
Course Code	**CIEM 436**	
Prerequisites	None	
Classification within the curriculum	Elective (Track-2 and Track-3)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to environmental crisis and built environment, sustainability definition and its components and indicators (social, environmental, economic and institutional), green building principles (green technology, processes and solutions), sustainable design certificate program (LEED). Topics include ecological design practices, passive and mechanical comfort modification, sustainable building materials and practices, low carbon buildings, urban ecology, economy of resources and life cycle design, renewable energy systems, recycling and reuse in construction.

Lab and Tutorials

This is a theoretical course that includes tutorial for discussion on the topic.

Literature

Course Textbook:

- Birkeland, Janis. “Design for Sustainability: A Sourcebook of Integrated, Ecological Solutions” Earthscan, ISBN: 9781849770958 (2002).

Additional References:

- Thwaits, K., “Urban Sustainability through Environmental Design”, Taylor & Francis, ISBN-10: 041539547X (2008).

(CIEM) - CIEM 437

Course Title	**Freight and Logistics Management**	
Course Code	**CIEM 437**	
Prerequisites	MATH 103 - Probability & Statistics for Engineers	
Classification within the curriculum	Compulsory (Track-1)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Business	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to the structure of the freight industry and relates it to business logistics and planning of supply chains. Planning of freight services at the strategic, tactical, and operational levels, models of international, inter-city, and urban freight movements, and shipper behavior related to mode choice, carrier selection, and adoption of 3-PL and information technology options. Topics include introduction to the role of advanced technologies (ITS) in improving freight operations, and the implications of e-commerce on planning of freight services.

Lab and Tutorials

This is a theoretical course that includes tutorial for discussion on the topic.

Literature

Course Textbook:

- Lun, Yuen Ha, Lai, Kee Hung, Cheng, TCE, “Shipping and Logistics Management”. Springer-Verlag London. 978-1-84882-996-1 (2010).

Additional References:

- Oz, E., “Management Information Systems” (6th Edition), Course Technology, ISBN-10: 1423901789 (2008).

(CIEM) - CIEM 438

Course Title	**Value and Risk Management in Construction**	
Course Code	**CIEM 438**	
Prerequisites	CIEM 431 - Principles of Management and Human Resources	
Classification within the curriculum	Compulsory (Track-3)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
Topics include overview of value management (VM) in construction, the concept and types of value, the value process and value management procedures, opportunities for and benefits of value management, risk management (RM) in construction, types of risk and uncertainty, value and risk management, decision making, and integration of value and risk management in construction projects.

Lab and Tutorials
This is a theoretical course that includes tutorial for discussion on the topic.

Literature
Course Textbook:

- Fleming, Q.W. and Koppelman, J.M. “Earned Value Project Management”, 3rd Edition, Project Management Institute, Inc. ISBN 1930699891 (2006).

Additional References:

- Langford D., and Male S., “Strategic Management in Construction”. 2nd Ed., Oxford, Blackwell Science: ISBN 0632049995 (2001).

(CIEM) - CIEM 439		
Course Title	**Building Information Modeling**	
Course Code	**CIEM 439/ARUD 463**	
Prerequisites	None	
Classification within the curriculum	Elective (Track-3)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

The course is concerned with utilization of Building Information Modelling (BIM) technology. The aim of the course is to give students a practical, hands-on, introduction to BIM and related computer-based techniques for documentation and modelling of structures. The course will be focusing on the processes involved in developing 3D design models, not only for the purpose of visualization, but as a tool for understanding and documenting the operation and performance of buildings and facilities. The course incudes principles of components modelling, process of components assembly, and exported and imported BIM models. Parts of the lectures will be delivered by guests from industry to understand the technology from that perspective.

Lab and Tutorials

During the lab sessions student will work on BIM software as Revit platform then will present their project through tutorials.

Literature

Course Textbook:

- BIM Handbook, Autodesk Revit handout, Bentley handout, AIA and UK Codes for BIM.

(CIEM) - CIEM 441

Course Title	**Fundamentals of Hydraulic Engineering**	
Course Code	**CIEM 441**	
Prerequisites	CIEM 341 - Fluid Mechanics	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description
The aim of this course is to explore the topics related to water, wastewater and storm water systems, open channel hydraulics, syphons, culverts, basics of hydrology and ground water flow, roadway drainage systems, and overview of other hydraulic structures. The course also includes an introduction to irrigation systems.

Lab and Tutorials
This is an analytical course that includes tutorial for problem solving and 50% in the hydraulics lab for demonstration.

Literature
Course Textbook:

- Warren Viessman, Jr. & Gary L. Lewis, "Introduction to Hydrology, 5/E", Prentice Hall, ISBN: 067399337X (2003)

Additional References:

- Richard H. McCuen , "Hydrologic Analysis and Design, 3/E", Prentice Hall, ISBN: 0131424246 (2005)
- David A. Chin, "Water-Resources Engineering, 2/E ", Prentice Hall, ISBN: 0131481924 (2007)

(CIEM) - CIEM 451

Course Title	**Introduction to Transportation and Highway Engineering**	
Course Code	**CIEM 451**	
Prerequisites	CIEM 312 - Soil Mechanics	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Program Requirements	

Description
The aim of this course is to explore the topics related to transportation system characteristics, functional classification of road network, criteria of geometric design, design of roadway horizontal and vertical alignments, cross section elements, type of road pavement, and design of highway flexible/rigid pavements.

Lab and Tutorials
This is a design course that includes tutorial for problem solving and 50% in the transportation lab to test asphalt samples.

Literature
Course Textbook:

- A. S. Narasimha Murthy, Henry R. Mohle, “Transportation Engineering Basics”, ASCE Publications, (2001).

Additional References:

- Yang H. Huang, "Pavement Analysis and Design", Prentice Hall, ISBN: 0131424734 (2004).
- T.F. Fwa, “The Handbook of Highway Engineering”, CRC Press, (2005).

(CIEM) - CIEM 452

Course Title	**Traffic Engineering**	
Course Code	**CIEM 452**	
Prerequisites	MATH 103 - Probability & Statistics for Engineers	
Classification within the curriculum	Compulsory (Track-1)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related traffic flow theory and modeling, queuing theory, design of traffic control devices, traffic signs and markings, traffic data collection methodologies, as well as design and implementation of traffic studies.

Lab and Tutorials
This is a design course that includes tutorial for problem solving.

Literature
Course Textbook:

- M. G. H. Bell & Yasunori Iida, "Transportation Network Analysis", John Wiley & Sons Inc., ISBN: 9780471964933 (1997).

Additional References:

- Vukan R. Vuchic, "Urban Transit Systems and Technology", John Wiley & Sons Inc., Hoboken, New Jersey, ISBN: 9780471758235 (2007).

(CIEM) - CIEM 453

Course Title	**Public Transit Planning and Operations**	
Course Code	**CIEM 453**	
Prerequisites	CIEM 351 - Transportation Planning	
Classification within the curriculum	Compulsory (Track-1)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to urban transit operations and planning, with special emphasis on best-practice strategies of modern transit systems. Topics include transit system strategic planning, transit ridership, transit system operations design, transit system performance evaluation, transit system operational challenges and mitigation plans, and the operations of rail-based transit system.

Lab and Tutorials
This is an analytical course that includes tutorial for problem solving.

Literature
Course Textbook:

- Juan de Dios Ortuzar & Luis G. Willumsen, "Modeling Transport, 3rd Edition", John Wiley & Sons Inc., ISBN: 9780471861102 (2001).

Additional References:

- M. G. H. Bell & Yasunori Iida, "Transportation Network Analysis", John Wiley & Sons Inc., ISBN: 9780471964933 (1997).
- Jeffrey Tumlin, “Sustainable Transportation Planning”, John Wiley and Sons, (2011).

(CIEM) - CIEM 454

Course Title	**Highway Engineering**	
Course Code	**CIEM 454**	
Prerequisites	CIEM 451 - Introduction to Transportation and Highway Engineering	
Classification within the curriculum	Compulsory (Track-1)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Basic Engineering Sciences	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related highways geometric design guides, speeds and sight distances, alignment and three dimensional coordination, design consistency, highways drainage, Bituminous materials, quality control, pavement condition assessment, and development of detailed design drawings for highways.

Lab and Tutorials
This is a design course that includes tutorial for problem solving.

Literature
Course Textbook:

- A. S. Narasimha Murthy, Henry R. Mohle, “Transportation Engineering Basics”, ASCE Publications, (2001).

Additional References:

- Yang H. Huang, "Pavement Analysis and Design", Prentice Hall, ISBN: 0131424734 (2004).
- T.F. Fwa, “The Handbook of Highway Engineering”, CRC Press, (2005).

(CIEM) - CIEM 455		
Course Title	**Fundamentals of Intelligent Transportation Systems**	
Course Code	**CIEM 455**	
Prerequisites	CIEM 452 - Traffic Engineering	
Classification within the curriculum	Elective (Track-1)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to emerging concepts and elements of Intelligent Transportation Systems (ITS) with a focus on Advanced Traffic Management and Information Systems (ATMIS). Topics include ITS system architecture and user services, ITS enabling technologies, traffic flow theory for ITS, static and dynamic network modeling, freeway management and control, adaptive signal control, incident management, traveler information systems and route guidance, corridor management, and ITS simulation, ITS communication technology, and time permitting.

Lab and Tutorials
This is an analytical course that includes tutorial for problem solving.

Literature
Course Textbook:

- M. G. H. Bell & Yasunori Iida, "Transportation Network Analysis", John Wiley & Sons Inc., ISBN: 9780471964933 (1997).

Additional References:

- Vukan R. Vuchic, "Urban Transit Systems and Technology", John Wiley & Sons Inc., Hoboken, New Jersey, ISBN: 9780471758235 (2007).

(CIEM) - CIEM 456

Course Title	**Maritime and Airport Transit**	
Course Code	**CIEM 456**	
Prerequisites	CIEM 437 - Freight and Logistics Management	
Classification within the curriculum	Compulsory (Track-1)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to characterization of port system, geographical location of ports and related planning and operational issues, methods and processes for port planning and design, inland connectivity, port's linkage to transport infrastructure, intermodal connections, marine operations in ports, traffic management, vessel traffic system (VTS), pilotage and tugs, port navigational system, cargo handling, terminal operations, facilities, equipment, and port security.

Lab and Tutorials
This is a design course that includes tutorial for problem solving.

Literature
Course Textbook:

- Mo Y. Shahin, "Pavement Management for Airports, Roads, and Parking Lots", Springer Science & Business Media, (2005).

Additional References:

- Paul H. Wright & Karen Dixon, "Highway Engineering, 7th Edition", John Wiley & Sons Inc., Hoboken, New Jersey, ISBN: 9780471264613 (2003).
- G. Macpherson, "Highway and Transportation Engineering and Planning", Longman, ISBN: 0582097983 (1993).

(CIEM) - CIEM 457		
Course Title	**Transportation Systems Safety**	
Course Code	**CIEM 457**	
Prerequisites	CIEM 452 - Traffic Engineering	
Classification within the curriculum	Elective (Track-1)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to fundamentals of safety analysis for different transport systems including roadway, railway, and maritime transport. Topics include safety audits, safety performance functions and models, safety enhancements and counter measures.

Lab and Tutorials
This is a theoretical course that includes tutorial for discussion on the topic.

Literature
Course Textbook:

- Evans, Leonard, “Traffic Safety”. Bloomfield Hills, Michigan: Science Serving Society. ISBN 0-9754871-0-8 (2004).

Additional References:

- Evans, Leonard, “Traffic Safety and the Driver”. New York: Van Nostrand Reinhold. ISBN 0-442-00163-0 (1991).

(CIEM) - CIEM 458		
Course Title	**Design and Operations of Railway Systems**	
Course Code	**CIEM 458**	
Prerequisites	CIEM 453 - Public Transit Planning and Operations	
Classification within the curriculum	Elective (Track-1)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to railway systems, track component and system design, construction, evaluation, maintenance, load distribution, and wheel/rail interaction. Topics also include lifecycle of modern rail systems, rolling stock, railway signaling and control, railway safety assurance, and basics of high speed rail systems.

Lab and Tutorials
This is a design course that includes tutorial for problem solving.

Literature
Course Textbook:

- Clifford F. Bonnett, “Practical Railway Engineering”, 2nd Edition, Imperial Collage Press. ISBN-13: 978-1860945151 (2005).

Additional References:

- Mundrey, “Railway Track Engineering”. McGraw-Hill Education, ISBN: 9780074637241 (2000).

(CIEM) - CIEM 471

Course Title	**Design and Operations of Water and Wastewater Treatment Plants**	
Course Code	**CIEM 471**	
Prerequisites	CIEM 371 - Chemical and Biological Treatment Processes	
Classification within the curriculum	Compulsory (Track-2)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to design of water and wastewater treatment plants. This includes introduction to wastewater treatment plant design, design flow rates, design mass loadings, process selection, elements of conceptual process design, physical unit operations, flow measurement, flow equalization, design of physical treatment units, communities and grit chambers. Topics include design of physical treatment units, primary sedimentation tanks and dissolved air flotation, design of biological treatment units, activated sludge processes, design of aeration systems, design of sludge disposal/treatment facilities, solids and sludge sources, characteristics, and quantities, regulations, thickening, and dewatering.

Lab and Tutorials

This is a design course that includes tutorial for problem solving.

Literature

Course Textbook:

- Mark J. Hammer, "Water and Wastewater Technology SI, 5/E", Prentice Hall, ISBN: 013197307X (2005).

Additional References:

- Gilbert M. Masters, "Introduction to Environmental Engineering and Science: International Edition, 2/E", Prentice Hall, ISBN: 0138965498 (1998).

(CIEM) - CIEM 472

Course Title	**Design, Construction and Operations of Water and Sewer Networks**	
Course Code	**CIEM 472**	
Prerequisites	CIEM 441 - Fundamentals of Hydraulic Engineering	
Classification within the curriculum	Compulsory (Track-2)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to hydraulic network modeling of pressurized and gravity systems, modeling considerations and assumptions, use of state of the art software in modeling flows in pressurized and gravity systems, sewer networks construction methods, considerations and quality assurance for pipeline systems, condition assessment technologies and rehabilitation methods, and the use of GIS for pipeline management.

Lab and Tutorials

This is a design course that includes tutorial for problem solving.

Literature

Course Textbook:

- Warren Viessman, Jr. & Mark J. Hammer, "Water Supply and Pollution Control, 7/E", Longman, ISBN: 0131409700 (2005).

Additional References:

- Mark J. Hammer, " Water and Wastewater Technology, 4/E", Prentice Hall, 533 pp, (2008)
- Mackenzie L Davis, “Principles of Environmental Engineering and Science”, McGraw-Hill Education, 864 pages, (2013).

(CIEM) - CIEM 473

Course Title	**Design and Operation of Electro-Mechanical Systems**	
Course Code	**CIEM 473**	
Prerequisites	CIEM 341 - Fluid Mechanics	
Classification within the curriculum	Compulsory (Track-2)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to types of electrical and mechanical units in pump stations and treatment plants, design and operational considerations, pump-pipeline systems, pump characteristic curves, system curves, pipe material, fittings and accessories, control valve sizing and selection of air valve design. Operational considerations, condition monitoring, and replacement practices for electromechanical systems.

Lab and Tutorials

This is a design course that includes tutorial for problem solving.

Literature

Course Textbook:

- Enrique Cabrera, “Pumps, Electromechanical Devices and Systems Applied to Urban Water Management” Vol. 2, Taylor & Francis, ISBN 9058095606 (2003).

Additional References:

- Other articles related to topic.

(CIEM) - CIEM 474		
Course Title	**Field Measurement and Water Quality**	
Course Code	**CIEM 474**	
Prerequisites	CIEM 372 - Environmental Hydraulics	
Classification within the curriculum	Elective (Track-2)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	0.75
	Labs	0.75
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description
The aim of this course is to explore the topics related to fundamentals of competence with instruments, field techniques and basic statistical sampling and data summarization techniques commonly applied in hydrology. Topics cover measuring surface and groundwater parameters, stream flow, identifying channel cross section, and measuring climatic parameters.

Lab and Tutorials
This is an analytical course that includes tutorial for problem solving and 50% in the environmental lab to conduct tests on water samples.

Literature
Course Textbook:

- T.H.Y. Tebbutt, ''Principles of Water Quality control, 5th Edition'', Butterworth, ISBN 9780080539683.

Additional References:

- Nigel W.T. Quinn, ''International views on water quality management and control pollutants'', Intech, ISBN 978-953-51-0999-0.

(CIEM) - CIEM 475

Course Title	**Environmental Assessments of Infrastructure Systems**	
Course Code	**CIEM 475**	
Prerequisites	None	
Classification within the curriculum	Compulsory (Track-2) and Elective (Track-1)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topics Category	Engineering Applications	
Topics Level	Specialization Requirements	

Description

The aim of this course is to explore the topics related to EIA definition, history, EIA procedures, base line environment, screening, scoping, impact assessment, mitigation measure, environmental management plan, EIA screen in Egypt, and environmental impacts on surface water, ground water, air, noise impact, health impact, culture impact. Topics include the impact assessment methods, check list, simple matrix, stepped matrix, loops, networks, and the development of an environmental management plan.

Lab and Tutorials

This is a theoretical course that includes tutorial for discussion on the topic.

Literature

Course Textbook:

- Andrew Allan, “Infrastructure Sustainability and Design, Construction Management and Economics”. DOI: 10.1080/01446193.2012.727009 (2012).

Additional References:

- Yacov Y. Haimes, “Risk Modeling, Assessment, and Management”. John Wiley & Sons ISBN: 9781119017981 (2015).

(CIEM) - CIEM 493

Course Title	**Graduation Project I**	
Course Code	**CIEM 493**	
Prerequisites	Senior Standing	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	
	Labs	
	TOTAL	3
EG Credit Hours	3	
ECTS	6	
Student Workload (SWL) / semester	180	
Topic Category	Projects and Practical Training	
Topic Level	Program Requirements	

Description
The aim of this application-oriented project is to show competence in the major academic area, where an independent design project is conducted under the guidance of a faculty member in the CIEM program. The design project should contribute to the advancement of knowledge in the field by utilizing computer software such as finite element packages for structural analysis. Professional drawings, calculation sheets, written report, and formal presentation are required.

Lab and Tutorials
This is a design project that does not include lectures, labs or tutorials.

Literature
Course Textbook:

- Design codes relevant to project area.

Additional References:

- Project statement prepared by supervisor.

(CIEM) - CIEM 495

Course Title	**Graduation Project II**	
Course Code	**CIEM 495**	
Prerequisites	CIEM 493 - Graduation Project I	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	
	Labs	
	TOTAL	3
EG Credit Hours	3	
ECTS	6	
Student Workload (SWL) / semester	180	
Topic Category	Projects and Practical Training	
Topic Level	Program Requirements	

Description

The aim of this research-oriented project is to develop the state-of-the-art outcomes in the major academic area and contribute to the existing knowledge, where an independent research project is conducted under the supervision of a faculty member in the CIEM program. The research project should include experimental and analytical works using the laboratories and computer facilities of the program. Finding from this research project can be used in the design project CIEM 493. Writing a technical paper and formal presentation are required.

Lab and Tutorials

This is a research project that includes lab work comprise experimental testing and/or numerical modeling depending on the project nature.

Literature

Course Textbook:

- Literature and publications relevant to project area.

Additional References:

- Project statement prepared by supervisor.

(CIEM) - ENTR 301

Course Title	**Selected Topics in Entrepreneurship**	
Course Code	**ENTR 301**	
Prerequisites	None	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	1.5
	Tutorials	1.5
	Labs	
	TOTAL	3
EG Credit Hours	2	
ECTS	4	
Student Workload (SWL) / semester	100	
Topics Category	Business	
Topics Level	Specialization Requirements	

Description

In this course, students get an overview about the definition of entrepreneurship, examples of successful innovations, and the prospects of starting a company. The course covers idea generation and identifying opportunities, business model canvas, and an overview of some business fundamentals such as types of businesses and business functions, in addition to communication and presentation skills. The selection of the topic should be related to the specialization it is offered to.

(CIEM) - IENG 202		
Course Title	**Operations Research I**	
Course Code	**IENG 202**	
Prerequisites	MATH 104 - Linear Algebra	
Classification within the curriculum	Elective (All Tracks)	
Course Position in Study Plan	Fall	
Contact Hours	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL)	125	
Topics Category	Basic Engineering Sciences	
Topics Level	Specialization Requirements	

Description
This course introduces the decision making process criteria to students, and differentiates between different decision making environments. Students are given the knowledge and experience of problem solving techniques through using different operations research modeling and solution techniques, for example linear and integer programing, graphical and analytical solution methods. Through practical applications, assignments and the final projects students learn how to utilize suitable tools at different problem solving situations.

Lab and Tutorials
The course requires practice and problem solving training during tutorials, in addition to training on software to solve general OR problems.

Literature-

- Barry Render, Ralph M. Stair, JR, and Michael E. Hanna, “Quantitative Analysis for Management”, 10th Edition, Pearson Prentice Hall, 2009.
- Frederick S. Hillier and Gerald J. Lieberman, Introduction to Operations Research (8th ed.), McGraw Hill, New York (2005).
- Hamdy A. Taha, Operations Research: An Introduction (6th ed.),

(CIEM) - NSCI 102

Course Title	**Selected Topics in Environmental Science**	
Course Code	**NSCI 102**	
Prerequisites	None	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	3
	Labs	
	TOTAL	6
EG Credit Hours	4	
ECTS	6	
Student Workload (SWL) / semester	150	
Topic Category	Engineering Culture	
Topic Level	Specialization Requirements	

Description
The aim is to select a course to explore one of the topics related to physics, chemistry, biology, geology, or environmental science. The selection of the topic should be related to the specialization it is offered to.