برنامج الهندسة الكهروميكانيكية

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الهدف من طرح البرنامج:-

هندسة الكهروميكانيكا هو مجال علمي ومهنى يختص بتصميم وتنفيذ و إدارة مشاريع الأنظمة الميكانيكية و الكهربائية في المبانى والمنشآت المختلفة. وتركز الدراسة في هذا البرنامج على الاحترافية في التصميم الهندسي و استيعاب الممارسة القانونية والمهنية ذات الصلة بالموافقات الحكومية بمشاريع الأنظمة الميكانيكية و الكهربائية وأساليب التنفيذ والتنسيق فيما بينها والمواد والأنظمة والمعدات والتخطيط والجدولة الزمنية والسلامة المهنية وتحليل ومراقبة التكاليف. ونظرا لأن معظم برامج الهندسة الميكانيكية و الكهربائية التقليدية والموجودة حاليا لا تغطى في دراستها المعرفة المطلوبة للعمل في مشروعات الأنظمة الميكانيكية و الكهربائية بشكل متكامل ومنسق وبالصورة التي تمكنه من استغلال التقنيات الحديثة المتاحة، مما يخلق مشكلة في سوق العمل المحلي والعربي بعدم توافر مهندسين خريجين لديهم الدراية والمعرفة بهذه الأنظمة. لذا كان الهدف من هذا البرنامج هو تخريج مهندس قادر على تصميم وتنفيذ وصيانة الأنظمة الميكانيكية والكهربائية فى المبانى و المنشآت المختلفة .

ونظرا لأهمية هذا المجال وخاصة في ضوء نهضة المشاريع القومية التى تشهدها مصر في هذه العقود تسعى كلية الهندسة ببنها في انشاء برامج متخصصة في هذا المجال تعمل على تخريج مهندسين متخصصين في هذه الأعمال وتلبى حاجة سوق العمل لهذا التخصص ويكون لديهم القدرة على تصميم وإدارة مشاريع الأنظمة الميكانيكية و الكهربائية ومنها:

الأنظمة الميكانيكية

- أنظمة التكييف المركزى والتهوية والتدفئة HVAC system
- أنظمة مكافحة الحريق Fire Fighting System
- انظمة ادارة الدخان Smoke Management System
- أنظمة المياه والصرف الصحى Plumbing System
- وانظمة المواسير المختلفة Piping Network and Gases System
- أنظمة تسخين المياه وتوليد البخار Water Heating and Steam Generation System

الأنظمة الكهربائية

- أنظمة الإضاءة Lighting System
- أنظمة القوى الكهربائية وتوزيعها Power Distributions Systems

- أنظمة إنذار الحريق Fire Alarm System
- أنظمة كاميرات المراقبة و الأمان CCTV Systems
- أنظمة الاتصالات Communications Systems
- أنظمة التيار الخفيف Low Current Systems
- أنظمة القوى الكهربائية الاحتياطية Electric generators and USP Systems
- نظم التحكم وانظمة ادارة المبانى Control and Building Management System
- المبانى الذكية Smart Buildings

وسوق العمل فى حاجة الى مهندس قادر على العمل فى جميع هذه الأنظمة معا للأسباب الأتية:

- نظرا الى ما تحتاجه هذه الأنظمة فى التنسيق فيما بينها
- تقليل عدد المهندسين العاملين فى هذه الأنظمة داخل المنشاة فبدلا أن يكون عندنا مهندس لكل تخصص (كهرباء أو ميكانيكا) وتكون الأعمال غير كافية لشغل وقت كل منهما فبوجود هذا البرنامج يمكن ان يعمل مهندس واحد فى منشأة ويكون قادر على العمل فى جميع الأنظمة الكهربائية و الميكانيكية.
- معظم برامج الهندسة الميكانيكية والكهربائية التقليدية والموجودة حاليا لا تغطى في دراستها المعرفة المطلوبة للعمل في معظم هذه الأنظمة، مما يخلق مشكلة فى سوق العمل بعدم توافر مهندسين خريجين لديهم الدراية والمعرفة بهذه الأنظمة .

ويمكن تصنيف المهندسين خريجى هذا البرنامج وفقا لطبيعة العمل الذى يقوم به كما يلى:

- **مهندس تصميم**: وضع أساسيات و تفاصيل العديد من مشاريع الأنظمة الكهربائية و الميكانيكية والتى سبق ذكرها.
- **مهندس موقع (اشراف أو تنفيذ):** يطبق و ينسق عمليات التنفيذ لمشاريع الأنظمة الكهربائية و الميكانيكية في الموقع والتنسيق فيما بينها.
- **مهندس تشغيل وصيانة**: مسئول عن تشغيل وصيانة جميع الأنظمة الكهربائية و الميكانيكية .

سمات مهندس الكهروميكانيكا

الهدف الرئيسي للبرنامج هو إعداد مهندس قادر على العمل المهني في مجال هندسة النظم الكهربائية و الميكانيكية من خلال اكساب الدارسين المهارات التقنية الضرورية والمهارات الشخصية والمعرفة في هذا المجال، بالإضافة إلى السمات العامة للمهندس، فأن المهندس خريج هذا البرنامج يكون قادرا على:

- تطبيق التقنيات التحليلية و التجريبية و تصميم مفردات هندسة الأنظمة الكهربائية و الميكانيكية وإدارتها والتنسيق فيما بينها مع إجادة استخدام الأدوات الحديثة لذلك.
- فهم التطبيقات العالمية والأخلاقية والاجتماعية للمهنة في ما يخص قضايا السلامة والاستدامة العامة.
- تحصيل والاستفادة والتواصل وامتلاك مهارات القيادة الشخصية و قادر على العمل بشكل تعاوني في فريق متعدد التخصصات.
- مواصلة العمل المتميز و التعلم المستمر مدى الحياة.

أ. **المخرجات التعليمية للبرنامج:-**

وفقا للهيئة القومية لضمان جودة التعليم والاعتماد، يجب أن يلبى برنامج الهندسة الكهروميكانيكية مخرجات التعلم التالية:-

اولا: مخرجات المعرفة والفهم

يجب أن يكون خريج برنامج الهندسة الكهروميكانيكية قادر على إثبات المعرفة والفهم في:

1. المفاهيم والنظريات الرياضيات والعلوم الاساسية.
2. أساسيات تكنولوجيا المعلومات والاتصالات.
3. خصائص المواد الهندسية.
4. مبادئ التصميم بما في ذلك عناصر التصميم، لعملية و/أو لنظام.
5. منهجيات حل المشاكل الهندسية، وجمع البيانات وتفسيرها.
6. التنسيق بين الأنظمة الميكانيكية و الكهربائية.
7. نظم ضمان الجودة و أكواد الممارسات والمعايير، ومتطلبات الصحة والسلامة والقضايا البيئية.
8. مبادئ إدارة الأعمال ذات الصلة بالهندسة.
9. التقنيات الهندسية الحالية.
10. مواضيع تتعلق بالاهتمامات الإنسانية والقضايا الأخلاقية.
11. اللغة الفنية وكتابة التقارير الفنية.
12. الأخلاق المهنية وتأثيرات الحلول الهندسية على المجتمع والبيئة.
13. الموضوعات الهندسية المعاصرة.
14. عمليات التشييد الأساسية والتكنولوجيات والتقنيات المستخدمة في مجال الهندسة الكهروميكانيكية.
15. مبادئ علوم هندسة الهندسة الكهروميكانيكية.
16. خواص وسلوك وتصنيع مواد الأنظمة الكهروميكانيكية

17. مبادئ التصميم الخاصة بالأنظمة الكهروميكانيكية.

18. إدارة المشاريع بما في ذلك التخطيط والتمويل وتقديم العطاءات، وإجراءات العقد، و تقدير التكلفة وأنظمة الجودة.

19. الأساليب التحليلية تطبيقات الكمبيوتر التي يمكن تطبيقها على مختلف مجالات الأنظمة الميكانيكية و الكهربائية.

ثانيا: مخرجات المهارات الفكرية

يجب أن يكون خريج برنامج الهندسة الكهروميكانيكية قادر على إظهار المهارات الفكرية التالية:-

1. اختيار الطرق الرياضية والتي تعتمد على الكمبيوتر المناسبة للنموذجة وتحليل المشاكل.

2. اختيار الحلول المناسبة للمشاكل الهندسية القائمة على التفكير التحليلي.

3. التفكير بطريقة خلاقة ومبتكرة في حل و تصميم المشكلات.

4. جمع وتبادل وتقييم الأفكار المختلفة، وجهات النظر، والمعرفة من مجموعة من المصادر.

5. تقييم خصائص وأداء المكونات والنظم والعمليات.

6. فحص انهيار المكونات والنظم والعمليات.

7. حل المشاكل الهندسية، وغالبا على أساس معلومات محدودة وربما متناقضة.

8. اختيار وتقييم أدوات تكنولوجيا المعلومات والاتصالات المناسبة لمجموعة متنوعة من المشاكل الهندسية.

9. تحديد القرارات الهندسية المتعلقة بالتكاليف المتوازنة، والفوائد، والسلامة، والجودة، والموثوقية، والأثر البيئي.

10. دمج الأبعاد المجتمعية والاقتصادية والبيئية وإدارة المخاطر في التصميم.

11. تحليل نتائج النماذج العددية وتقييم حدودها.

12. خلق أساليب منظمة ومنهجية عند التعامل مع التكنولوجيا الجديدة والمتقدمة.

13. تعريف وحل مشاكل هندسية الهندسة الكهروميكانيكية.

14. حل المشاكل البيئية والاجتماعية والاقتصادية.

15. تحديد مستويات وأنواع وأنظمة الهندسة الكهروميكانيكية.

16. تقييم ودمج المعلومات والعمليات من خلال العمل في المشروع فردياً وجماعياً.

17. حل مجموعة واسعة من المشاكل المرتبطة بتحليل وتصميم وتنفيذ المباني.

18. تحليل وتفسير المعلومات التمويلية.

19. اقتراح حلول وتصاميم على المستوى الأساسي وفي التفاصيل بالنظر إلى الاستدامة وغيرها من القضايا ذات الأهمية

ثالثا: مخرجات عملية ومهنية

يجب أن يكون خريج برنامج الهندسة الكهروميكانيكية قادر على إظهار المهارات العملية و المهنية التالية:-

1. تطبيق المعرفة في الرياضيات، والعلوم، وتكنولوجيا المعلومات والتصميم وسياق الأعمال والممارسات الهندسية مجمعة لحل للمشاكل الهندسية.
2. الدمج المهنى للمعرفة والفهم الهندسى، وردود الفعل لتحسين تصميم المنتجات و/أو الخدمات.
3. إنشاء و/أو إعادة تصميم عملية، مكون أو نظام، وتنفيذ التصاميم الهندسية المتخصصة.
4. التدريب على الدقة والجمالية في التصميم والنهج.
5. استخدام المرافق والتقنيات الحاسوبية، وأدوات القياس وورش العمل والمعدات المختبرية لتصميم التجارب، وذلك لجمع وتحليل وتفسير النتائج.
6. استخدام مجموعة واسعة من الأدوات التحليلية والتقنيات والمعدات، وحزم البرمجيات المتعلقة لتطوير برامج الكمبيوتر المطلوبة.
7. تطبيق أساليب النمذجة العددية للمشاكل الهندسية.
8. تطبيق أنظمة آمنة في العمل ومراقبة الخطوات المناسبة لإدارة المخاطر.
9. إظهار المهارات التنظيمية الأساسية ومهارات إدارة المشاريع.
10. تطبيق إجراءات ضمان الجودة واتباع القوانين والمعايير.
11. تبادل المعارف والمهارات مع المجتمع الهندسى والصناعى.
12. اعداد و عرض التقارير الفنية.
13. إعداد وتنفيذ مشاريع الهندسة الكهروميكانيكية.
14. استخدام معدات الموقع و المعمل بكفاءة وأمان.
15. مراقبة وتسجيل وتحليل البيانات في المختبر و الموقع.
16. استخدام أدوات المساعدة القائمة على الحاسوب وحزم البرمجيات لحل المشكلات وتحليل النتائج.
17. إعداد مسودات فنية ورسومات نهائية يدويا وباستخدام الحاسب.
18. إعداد تقارير حصر الكميات و تقديرات التكلفة، وجداول التنفيذ.
19. إدارة العقود و التحكم في الوقت والتكلفة والجودة للمشاريع.
20. عمل جداول لتحقيق المواعيد النهائية في الأنشطة المعقدة.

رابعا: مخرجات عامة و قابلة للنقل

يجب أن يكون خريج برنامج الهندسة الكهروميكانيكية قادر على إظهار المهارات العامة و القابلة للنقل التالية:-

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

نسب المقررات الدراسية

يبين الجدول التالي نسب توزيع المقررات الدراسية للبرنامج ومقارناتها بمتطلبات الهيئة القومية لضمان جودة التعليم والاعتماد:

	Subject Area	CR	%	NARS Requirements
A	Humanities and Social Sciences (Univ. Req.)	18	10.11	9-12%
B	Mathematics and Basic Sciences	36	20.22	20-26%
C	Basic Engineering Sciences (Faculty/Spec. Req.)	39	21.91	20-23%
D	Applied Engineering and Design	39	21.91	20-22%
E	Computer Applications and ICT	16	9	9-11%
F	Projects and Practice	18	10.11	8-10%
G	Discretionary (Institution character-identifying) subjects	12	6.74	6-8%
Total		**178**	**100%**	

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

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

B.Mathematics and Basic Sciences Courses

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

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

Code	Course Name	Credit Hours
FRM109	Engineering Graphics	4
FRM106	Production Engineering	3
EMM206	Thermodynamics I	3
EME207	Electric Circuits I	3
EMM203	Fluid Mechanics I	3
EMM202	Strength and properties of materials	3
EMM204	Logic Circuits and Micro Processors	3
EME208	Electric Circuits II	3
EMM301	Fluid Mechanics II	3
EMM302	Thermodynamics II	3
EMM303	Mechanics of machinery	3
EMM307	Heat Transfer	3
EMM303	Projects Management	2
Total		**39**

D. Applied Engineering and Design Courses

Code	Course Title	Credit Hours
EMM209	Measurements and Instrumentation	3
EMM210	Manufacture Technology	3
EMM304	Vibrations and system dynamics	3
EME306	Electronic Devices and Circuits	3
EMM308	Solid Mechanics	3
EME307	Electrical Power Systems	3
EMM309	Design of Machine Elements	3
EMM401	Refrigeration	3
EMM402	Air Conditioning Systems	3
EMM403	Fluid Machinery	3
EMM408	Combustion and Engines	3
EME502	Electrical Machines	3
EMM503	Components of Refrigeration & AC Systems	3
Total		**39**

E. Computer Applications and ICT

Code	Course Title	Credit Hours
EMM201	Computer aided drafting (CAD)	3
EME405	Automatic Control	3
EME404	Low current distribution system	3
EMM501	Process Control and Building Management Systems	4
EME504	Computer Applications in Electromechanical Systems	3
Total		**16**

F. Projects and Practice

Code	Course Title	Credit Hours
EMM406	Fire Fighting Systems	3
EMM407	Plumbing Systems	3
EME409	Electric Power Distribution Systems I	3
EME410	Electric Power Distribution Systems II	3
EMM(E)521	Project I	3
EMM(E)522	Project II	3
Total		**18**

G. Elective Course

Code	Course Title	Credit Hours
Elective Course 1		3
EMM505	Renewable Energy	
EMM507	Elevators and Escalators	
EMM509	Solar Thermal and PV systems	
Elective Course 2		3
EME511	Advanced Industrial Electronics	
EME513	Communications Engineering	
EME515	Electrostatic and Electromagnetic Fields	

Code	Course Title	Credit Hours
Elective Course 3		3
EME506	Electro-hydraulic circuits	
EMM508	Codes and Specification of ElectroMechanical Systems	
EMM510	Computer Network	
Elective Course 4		3
EMM512	Cold Stores and Industrial Refrigeration	
EMM514	Automotive Engineering	
EMM516	Thermal power stations	
Total		**12**

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

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

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

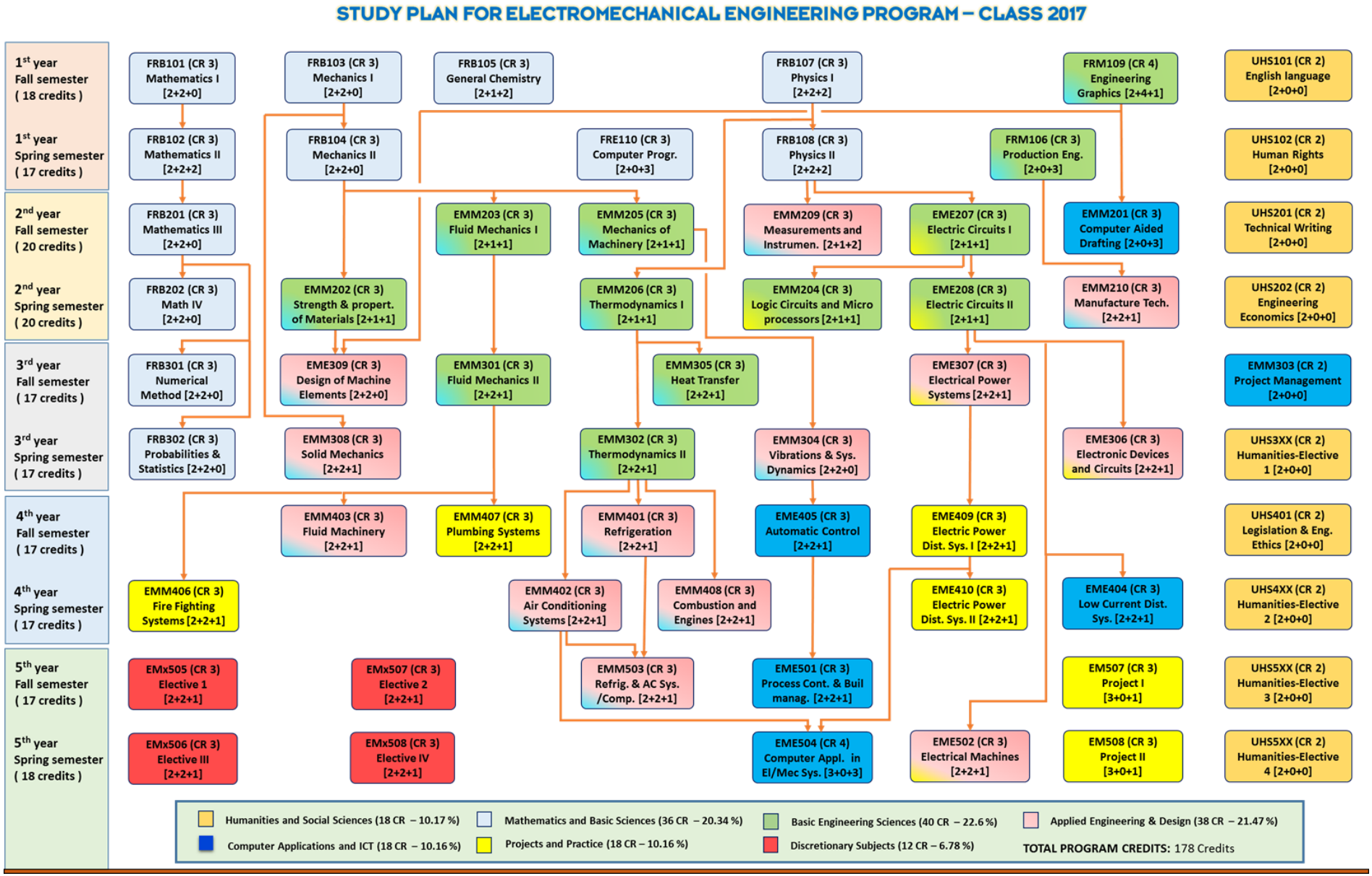
Program Courses Prerequisites

	Fall			Spring		
	Code	**Course Name**	**Prerequisites**	**Code**	**Course Name**	**Prerequisites**
First Year	FRB101	Mathematics I		FRB102	Mathematics II	FRB101
	FRB103	Mechanics I		FRB104	Mechanics II	FRB103
	FRB105	General Chemistry		FRM106	Production Engineering	
	FRB107	Physics I		FRB108	Physics II	FRB107
	FRM109	Engineering Graphics		FRE110	Computer Programming	
	UHS101	English language		UHS102	Human Rights	
Second Year	FRB201	Mathematics III	FRB102	FRB202	Math IV	FRB201
	EMM201	Computer Aided Drafting (CAD)	FRM109	EMM202	Strength and properties of Materials	FRB104
	EMM203	Fluid Mechanics I	FRB104	EMM204	Logic Circuits and Micro processors	EME207
	EMM205	Mechanics of Machinery	FRB104	EMM206	Thermodynamics I	FRB107
	EME207	Electric Circuits I	FRB108	EME208	Electric Circuits II	EME207
	EMM209	Measurements and Instrumentation	FRB108	EMM210	Manufacture Technology	FRM106
	UHS201	Technical Writing		UHS202	Engineering Economics	
Third Years	FRB301	Numerical Method	FRB201	FRB302	Probabilities & Statistics	FRB201
	EMM301	Fluid Mechanics II	EMM203	EMM302	Thermodynamics II	EMM206
	EMM303	Projects Management		EMM304	Vibrations and System Dynamics	EMM205
	EMM305	Heat Transfer	EMM206	EME306	Electronic Devices and	EME20
	EME307	Electrical Power Systems	EME208	EMM308	Solid Mechanics	FRB103
	EME309	Design of Machine Elements	FRM109, EMM202	UHS3XX	Humanities-Elective 1	
Fourth Year	EMM401	Refrigeration	EMM302	EMM402	Air Conditioning Systems	EMM302
	EMM403	Fluid Machinery	EMM301	EME404	Low Current Distribution Systems	EME208
	EME405	Automatic Control	EMM304	EMM406	Fire Fighting Systems	EMM301
	EMM407	Plumbing Systems	EMM301	EME408	Combustion and Engines	EMM302
	EME409	Electric Power Distribution Systems I	EME307	EMM410	Electric Power Distribution Systems II	EME409
	UHS401	Legislation & Engineering Ethics		UHS4XX	Humanities – Elective 2	
	EME501	Process Control and Building	EME405	EME502	Electrical Machines	EME208

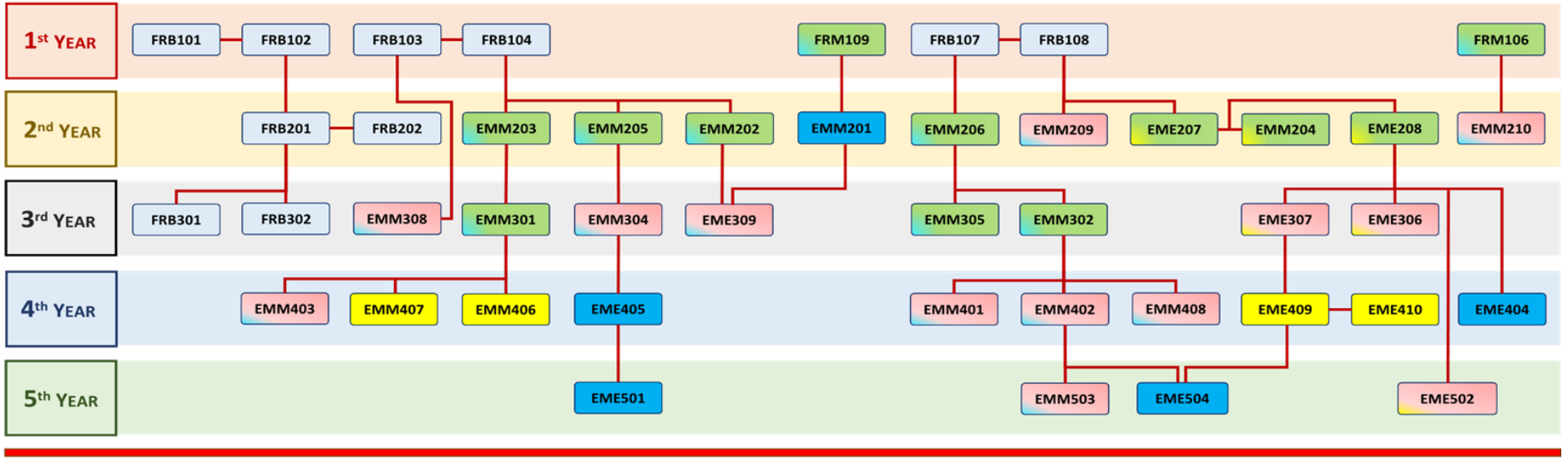
	Fall			Spring		
	Code	**Course Name**	**Prerequisites**	**Code**	**Course Name**	**Prerequisites**
Fifth Year	EMM503	Refrigeration and AC Systems/Components	EMM401, EMM402	EME504	Computer Applications in El/Mec System	EMM402, EME40
	EMM5XX	Elective 1		EME5XX	Elective III	
	EME5XX	Elective 2		EMM5X	Elective IV	
	UHS5XX	Humanities –Elective 3		UHS5XX	Humanities –Elective 4	
	EM507	Project I		EME508	Project II	

Elective Courses Prerequisites

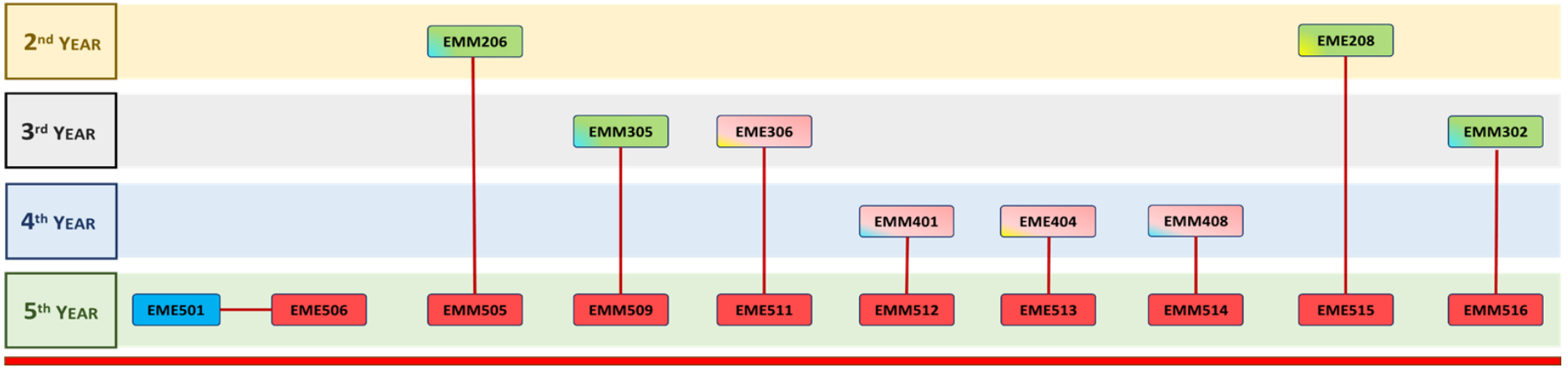
Code	Course Title	Prerequisites
Elective Course 1		
EMM505	Renewable Energy	EMM206
EMM507	Elevators and Escalators	
EMM509	Solar Thermal and PV systems	EMM305
Elective course 2		
EME511	Advanced Industrial Electronics	EME306
EME513	Communications Engineering	EME404
EME515	Electrostatic and Electromagnetic Fields	EME208
Elective Course 3		
EME506	Electro-hydraulic circuits	EMM501
EMM508	Codes and Specification of ElectroMechanical Systems	
EMM510	Computer Network	
Elective Course 4		
EMM512	Cold Stores and Industrial Refrigeration	EMM401
EMM514	Automotive Engineering	EMM408
EMM516	Thermal power stations	EMM302


STUDY PLAN FOR ELECTROMECHANICAL ENGINEERING PROGRAM – CLASS 2017
1st year Fall semester (18 credits)
1st year Spring semester (17 credits)
2nd year Fall semester (20 credits)
2nd year Spring semester (20 credits)
3rd year Fall semester (17 credits)
3rd year Spring semester (17 credits)
4th year Fall semester (17 credits)
4th year Spring semester (17 credits)
5th year Fall semester (17 credits)
5th year Spring semester (18 credits)
FRB101 (CR 3) Mathematics I [2+2+0]
FRB103 (CR 3) Mechanics I [2+2+0]
FRB105 (CR 3) General Chemistry [2+1+2]
FRB107 (CR 3) Physics I [2+2+2]
FRM109 (CR 4) Engineering Graphics [2+4+1]
UHS101 (CR 2) English language [2+0+0]
FRB102 (CR 3) Mathematics II [2+2+2]
FRB104 (CR 3) Mechanics II [2+2+0]
FRE110 (CR 3) Computer Progr. [2+0+3]
FRB108 (CR 3) Physics II [2+2+2]
FRM106 (CR 3) Production Eng. [2+0+3]
UHS102 (CR 2) Human Rights [2+0+0]
FRB201 (CR 3) Mathematics III [2+2+0]
EMM203 (CR 3) Fluid Mechanics I [2+1+1]
EMM205 (CR 3) Mechanics of Machinery [2+1+1]
EMM209 (CR 3) Measurements and Instrumen. [2+1+2]
EME207 (CR 3) Electric Circuits I [2+1+1]
EMM201 (CR 3) Computer Aided Drafting [2+0+3]
UHS201 (CR 2) Technical Writing [2+0+0]
FRB202 (CR 3) Math IV [2+2+0]
EMM202 (CR 3) Strength & propert. of Materials [2+1+1]
EMM206 (CR 3) Thermodynamics I [2+1+1]
EMM204 (CR 3) Logic Circuits and Micro processors [2+1+1]
EME208 (CR 3) Electric Circuits II [2+1+1]
EMM210 (CR 3) Manufacture Tech. [2+2+1]
UHS202 (CR 2) Engineering Economics [2+0+0]
FRB301 (CR 3) Numerical Method [2+2+0]
EME309 (CR 3) Design of Machine Elements [2+2+0]
EMM301 (CR 3) Fluid Mechanics II [2+2+1]
EMM305 (CR 3) Heat Transfer [2+2+1]
EME307 (CR 3) Electrical Power Systems [2+2+1]
EMM303 (CR 2) Project Management [2+0+0]
FRB302 (CR 3) Probabilities & Statistics [2+2+0]
EMM308 (CR 3) Solid Mechanics [2+2+1]
EMM302 (CR 3) Thermodynamics II [2+2+1]
EMM304 (CR 3) Vibrations & Sys. Dynamics [2+2+0]
EME306 (CR 3) Electronic Devices and Circuits [2+2+1]
UHS3XX (CR 2) Humanities-Elective 1 [2+0+0]
EMM403 (CR 3) Fluid Machinery [2+2+1]
EMM407 (CR 3) Plumbing Systems [2+2+1]
EMM401 (CR 3) Refrigeration [2+2+1]
EME405 (CR 3) Automatic Control [2+2+1]
EME409 (CR 3) Electric Power Dist. Sys. I [2+2+1]
UHS401 (CR 2) Legislation & Eng. Ethics [2+0+0]
EMM406 (CR 3) Fire Fighting Systems [2+2+1]
EMM402 (CR 3) Air Conditioning Systems [2+2+1]
EMM408 (CR 3) Combustion and Engines [2+2+1]
EME410 (CR 3) Electric Power Dist. Sys. II [2+2+1]
EME404 (CR 3) Low Current Dist. Sys. [2+2+1]
UHS4XX (CR 2) Humanities-Elective 2 [2+0+0]
EMx505 (CR 3) Elective 1 [2+2+1]
EMx507 (CR 3) Elective 2 [2+2+1]
EMM503 (CR 3) Refrig. & AC Sys. /Comp. [2+2+1]
EME501 (CR 3) Process Cont. & Buil manag. [2+2+1]
EM507 (CR 3) Project I [3+0+1]
UHS5XX (CR 2) Humanities-Elective 3 [2+0+0]
EMx506 (CR 3) Elective III [2+2+1]
EMx508 (CR 3) Elective IV [2+2+1]
EME504 (CR 4) Computer Appl. in El/Mec Sys. [3+0+3]
EME502 (CR 3) Electrical Machines [2+2+1]
EM508 (CR 3) Project II [3+0+1]
UHS5XX (CR 2) Humanities-Elective 4 [2+0+0]
Humanities and Social Sciences (18 CR – 10.17 %)
Mathematics and Basic Sciences (36 CR – 20.34 %)
Basic Engineering Sciences (40 CR – 22.6 %)
Applied Engineering & Design (38 CR – 21.47 %)
Computer Applications and ICT (18 CR – 10.16 %)
Projects and Practice (18 CR – 10.16 %)
Discretionary Subjects (12 CR – 6.78 %)
TOTAL PROGRAM CREDITS: 178 Credits

PREREQUISITES PLAN FOR ELECTROMECHANICAL ENGINEERING PROGRAM



ELECTIVES PREREQUISITES



نسب مقررات ميكانيكا و كهرباء بالبرنامج وشعبة التسجيل بنقابة المهندسين

Mechanical Course			Electrical Courses		
Code	**Course Name**	**Credit Hours**			
EMM206	Thermodynamics I	3	EME207	Electric Circuits I	3
EMM203	Fluid Mechanics I	3	EMM204	Logic Circuits and Micro Processors	3
EMM202	Strength and properties of materials	3	EME208	Electric Circuits II	3
EMM301	Fluid Mechanics II	3	EME306	Electronic Devices and Circuits	3
EMM302	Thermodynamics II	3	EME307	Electrical Power Systems	3
EMM303	Mechanics of machinery	3	EME502	Electrical Machines	3
EMM307	Heat Transfer	3	EME405	Automatic Control	3
EMM303	Projects management	2	EME404	Low current distribution system	3
EMM209	Measurements and Instrumentation	3	EME409	Electric Power Distribution Systems I	3
EMM210	Manufacture Technology	3	EME410	Electric Power Distribution Systems II	3
EMM304	Vibrations and system dynamics	3	EME5XX	Elective Course 2	3
EMM308	Solid Mechanics	3	EME5XX	Elective Course 3	3
EMM309	Design of Machine Elements	3			
EMM401	Refrigeration	3			
EMM402	Air Conditioning Systems	3			
EMM403	Fluid Machinery	3			
EMM408	Combustion and Engines	3			
EMM503	Components of Refrigeration & AC Systems	3			
EMM201	Computer aided drafting (CAD)	3			
EMM501	Process Control and Building Management Systems	4			
EME504	Computer Applications in Electromechanical Systems	3			
EMM406	Fire Fighting Systems	3			
EMM407	Plumbing Systems	3			
EMM5XX	Elective Course 1	3			
EMM5XX	Elective Course 4	3			
Total		**75**			**36**

- نسبة المقررات الميكانيكية فى حالة ان موضوع مشروع التخرج ميكانيكا = 116/81= 69.8%
- نسبة المقررات الميكانيكية فى حالة ان موضوع مشروع التخرج كهرباء = 116/75= 64.6%
- ففى جميع الحالات نجد ان نسبة المقررات الميكانيكية فى البرنامج تذيد عن 64% وبذلك يقيد الخريج **فى الشعبة الميكانيكية بنقابة المهندسين.**

COURSE DESCRIPTION

EMM201 Computer Aided Drafting (CAD) **3 (2, 0, 3)**

Prerequisite: FRM109 Engineering Graphics

Introduction to Computer Aided Drafting; history, advantages and limitation. Graphics/CAD involves the visualization, sketching, and geometric construction of mechanical components. Students will layout and create 2D working industrial drawings that adhere to industry standards. This course will illustrate CAD drawing construction techniques that implement graphical communication through the use of the alphabet of lines, orthographic projection, section views, auxiliary views and the creation of assembly and detail mechanical components.

Text Book

An Introduction to Computer-Aided Design [Andrew Mustun] CreateSpace Independent Publishing Platform, 2009

EMM202 Strength and properties of materials **3 (2, 2, 1)**

Prerequisite: FRB104 Mechanics

Introduction to engineering materials, Mechanics of deformable bodies: stress/strain, strain gages, material property relationships, classification of material behavior, generalized Hooke's law. Engineering applications: axial loads, torsion of circular rods and tubes, bending and shear stresses in beams, deflection of beams, combined stresses, stress and strain transformation, Microstructure of solid materials, Strengthening mechanisms, Types of Steel and their alloys, Materials selection. Phase diagram, Mechanical properties of materials, Electrical and magnetic properties of materials, Optical properties of materials.

Text Book

R. C. Hibbeler Mechanics of Materials Prentice Hall; 8th edition, 2010.

EMM203 Fluid Mechanics I **3 (2, 2, 1)**

Prerequisite: FRB104 Mechanics II

Fundamental notions; Physical properties of Fluids, Fluid viscosity and its importance's, viscous and non-viscous flow, compressibility and surface tensions and their applications on practical problems, fluid statics, buoyancy and stability of floating and immersed bodies, fluid in rigid body motion, fluid kinematics and Foundations of flow analysis; basic laws for finite systems and finite control volumes, differential forms of the basic laws, dimensional analysis and similitude analysis; Types of Flow (steady, uniform, Incompressible viscous flow, General viscous flows , Potential flow).

Text Book

Fluid Mechanics8 edition by Frank M. White Publisher: McGraw-Hill Education; 8 edition, 2015

EME204 Logic circuit and microprocessors **3 (2, 1, 1)**

Prerequisite: EME207 Electric Circuit 1

Number Systems, Boolean algebra, standard forms, simplification, minimization of logic expressions using k-map and tabular methods, Hardware Description Language (HDL), Digital logic gates, Analysis and Design of logic circuits, Synchronous sequential circuits, flip-flops, Analysis and design of clocked sequential circuits, synchronous counters, ripple counters. Memory and Programmable Logic and sequential programmable devices. Laboratory; basic logic gates and design of combinational logic circuits, Design and analysis

examples using HDL, design of simple synchronous sequential circuits such as registers, counters.
Text Book
Digital design, by M Morris Mano, Prentice Hall Inc. London, 2012.

EMM205 Mechanics of machinery **3 (2, 2, 0)**
Prerequisite: FRB104 Mechanics II
A study of the fundamental concepts underlying the study of velocity, acceleration, and force analysis of machines; linkages, cams, gears, and flywheels; balancing of rotating and reciprocating machine elements.
Text Book
Theory of Machines by R.S. Khurmi and J K Gupta S Chand & Co Ltd; 14th edition, 2005.

EMM206 Thermodynamics I **3 (2, 2, 0)**
Prerequisite: FRB107 Physics I
Definitions and basic concepts, Properties of pure substances and steam tables, Ideal gases properties, Heat and work, First Law of Thermodynamics (closed system, open system, steady flow), Applications of first law of thermodynamics. Second Law of thermodynamics (heat engines, refrigerators, heat pumps), reversible and irreversible process, irreversibility, Carnot cycles, Entropy and entropy increase principles, Entropy change for pre substances, solids and liquids, ideal gases, isentropic process relations of ideal gases, adiabatic and isentropic efficiency.
Text Book
Thermodynamics An Engineering Approach by Yunus A.Cengel Michael A.Boles, McGraw-Hill Education; 8 edition, 2014.

EME207 Electric Circuits I **3 (2, 2, 1)**
Prerequisite: FRB108 Physics II
DC circuit analysis: Circuit Variables, Kirchhoff's Laws, Simple Resistive Circuits, The Wheatstone Bridge, Δ to-Y (or π -to-T) Equivalent Circuits, The Node-Voltage Method and Dependent Sources, The Mesh-Current Method and Dependent Sources, The Venin and Norton Equivalents, Maximum Power Transfer, Superposition, Topology in Circuit Analysis, The Operational Amplifier circuits, Inductance and Capacitance, The Natural Response of RL and RC Circuits, Step Response of First-Order RL and RC Circuits.
Text Book
Electric Circuits, James W. Nilsson, Susan A. Riedel, Pearson educational Inc, 2012.

EME208 Electric Circuits II **3 (2, 1, 1)**
Prerequisite:EME207 Electric Circuits I
AC circuit analysis: Natural and Step Responses of RLC Circuits, Sinusoidal Steady-State Analysis, The Phasor, The Passive Circuit Elements (impedance and admittance), circuit theorems and Laws in the Frequency Domain, Sinusoidal Steady-State Power Calculations Appliance Ratings, power and energy, Balanced and unbalanced three-phase circuits. Two-port networks. Computer packages applications (EWB, Pspice, Matlab, etc.)
Text Book
Electric Circuits, James W. Nilsson, Susan A. Riedel, Pearson educational Inc, 2012

EMM209 Measurements and Instrumentation **3 (2, 1, 2)**
Prerequisite: FRB108 Physics II

Introduction, Error analysis and accuracy, Operating principles of sensors and transducers- Analog measuring instruments. General consideration for selection and evaluation of measurement equipment. Measuring of mechanical quantities (Temperatures, Pressures static and dynamic, Flow, and velocity, stress and strain,) Measurement of Electric quantities (currents, voltage, resistance, power). Comparisons methods for measurements. Active and reactive power measurements. Oscilloscopes. Digital millimeters- Uncertainty analysis.

Text Book

Measurement and Instrumentation Principles, Third Edition, Alan S Morris Publisher: Butterworth-Heinemann; 2001.

EME210 Manfacture Technology **3 (2, 2, 1)**

Prerequisite: FRM106 Production

Metal casting technology (soldification process, primary casting, production of primary metals, sand casting, shaped casting). Metal Forming technology (Hot and cold working on metal, metal forming process, pipe and tube manfacture). Welding processes. Mettal cutting technology (cutting and machine tools, turning, drilling, milling, boring, shaping and griniding processes). Metal welding technology (classification of weldings, perations for ferrous metals).

Text Book

A Textbook of Manufacturing Technology: Manufacturing Process by R.K. Rajput, Firewall Media, 2007.

EMM301 Fluid Mechanics II **3 (2, 2, 1)**

Prerequisites: EMM203 Fluid Mechanics I

Introduction to the theory and application of continuum fluid mechanics, Fluid properties and state relations. Incompressible laminar and turbulent flow using control volume, Reynolds Transport Theorem, and momentum and energy equations. Navier-Stokes Equations, Dimensional analysis, Buckingham Pi Theorem and modeling. Flow rate, pipe sizing and minor losses in pipe systems. Compressible flow and gas dynamics in boundary layer theory, mach number, stagnation properties and shock waves.

Text Book

Fluid Mechanics8 edition by Frank M. White Publisher: McGraw-Hill Education; 8th edition, 2015.

EMM 302 Thermodynamics II **3 (2, 3, 0)**

Prerequisite: EMM206 Thermodynamics I

Heat engine cycles; Carnot Cycle, Gas power cycles including gas turbine power cycles (Brayton Cycle and its modifications) and air standard cycles (Otto Cycle, Diesel Cycle and other standard cycles) to simulate reciprocating machines. Vapor cycles (Simple and modified Rankin cycles with modifications) and combined gas turbine-steam power cycles, Second law efficiency (availability/exergy analysis) and its application for energy and power cycles. Refrigeration and heat pumps, properties of gas mixtures, gas-vapor air-conditioning systems.

Text Book

Thermodynamics An Engineering Approach by Yunus A.Cengel Michael A.Boles, McGraw-Hill Education; 8th edition, 2014.

EMM303 Project Management **2 (2, 0, 0)**

Project Planning, Scheduling, and control, Project activities and network construction, Critical path method, PERT, Introduction to Resource scheduling, Material handling and inspection,

Project Economy. Applications in Electromechanical projects and case study.
Text Book
A Guide to Project Management Body of Knowledge: PMBOK, by Project Management Institute, 2016

EMM304 Vibrations & System Dynamics 3 (2, 2, 0)
Prerequisite: EMM205 Mechanics of machinery
Introduction to system dynamics concepts – Modeling of lumped elements – Dynamic modeling of physical systems– Analogy among Mechanical and electrical systems – Single degree of freedom systems subjected to natural and various types of forced motion. Dynamic systems response (first and second order systems). Multi degree of freedom systems, Two degree of freedom free and forced system, igen value and igen vectors.
Text Book
Mechanical. Vibrations, Singiresu S. Rao Pearson; 5 edition, 2010

EMM305 Heat Transfer 3 (2, 2, 1)
Prerequisite: EMM206 Thermodynamics I
Introduction and modes of heat transfers, Steady one-dimensional heat conduction in: plane walls, cylinders and spheres, heat transfer from finned surfaces, heat transfer in common configurations, transient heat conduction. Forced convection: over flat plate, across cylinders, tube-banks and inside tubes; natural convection: over surfaces and inside enclosures. Radiation heat transfer: radiation properties, view factors and radiation exchange between gray surfaces.
Text Book
Introduction to Heat Transfer Frank P. Incropera Wiley; 5 edition, 2006

EME306 Electronic Devices and Circuits 3 (2, 2, 1)
Prerequisite: EME208 Electric Circuits II
Semiconductor physics, Structure of diodes, Diode circuits and rectifiers, Structure of BJT, Biasing and operation modes of transistors, DC and small signal analysis of transistor circuits, Amplifiers circuits using BJT, Power amplifiers, Field effect transistors, Biasing of FET, Small signal model of FET. Amplifier circuits using FET, Design of amplifier circuits, Frequency response of amplifier circuits, Active filters, Feedback in electronic circuits, Different feedback configurations in electronic circuits, Oscillators circuits.
Text Book
Microelectronic Circuits by Adel S. Sedra and Kenneth C. Smith , Oxford University press.

EME307 Electrical power systems 3 (2, 2, 1)
Prerequisite: EME208 Electric Circuits II
Power system elements (prime movers, alternators, power transformers, transmission lines, etc.), Power elements (O.H.T. lines: parameters, performance, electrical design, Mechanical design of T.L transmission lines, Underground cables (construction, laying, performance), DC Power Transmission , Generation and measurement of high voltage for testing, Electrical breakdown in gases, liquids and solids, Phenomenon of over-voltages in power systems, traveling waves Lightning and lightning protection
Text Book
Principles of power system, by V. K. MEHTA,4th edition.
Electric power generation; transmission and distribution by Leonard L. Grigsby

Power system analysis and design, by J. D. Glover

EMM308 Solid Mechanics 3 (2, 2, 1)

Prerequisite: FRB103Mechanics I

Fundamental principles and methods of structural mechanics: static equilibrium, force resultants, support conditions, analysis of determinate planar structures (beams, trusses, frames), stresses and strains in structural elements, states of stress (shear, bending, torsion), statically indeterminate systems, displacements and deformations, introduction to matrix methods, elastic stability, and approximate methods. Design exercises to encourage creative student initiative and systems thinking.

Text Book

Engineering Mechanics for Structures, written by Professor Louis L. Bucciarelli, Courier Dover Publications, 2009 - Technology & Engineering

EMM309 Design of Machine Elements 3 (2, 2, 0)

Prerequisite: FRM109Engineering Graphics, EMM202 Strength and properties of materials

Mechanical design principles, Material selections, static and fatigue failure theory, Factor of safety and working stress, fasteners, rivets and bolted joints, power screw, shafts and axels, couplings, springs, belts and chain drives. Bearing and spur gears design. Introduction to Computer Aided Design.

Text Book

Machine Elements in Mechanical Design by, Robert L. Mott Pearson; 5th edition, 2013

EMM 401 Refrigeration 3 (2, 2, 1)

Prerequisite: EMM302 Thermodynamics II

Introduction to refrigeration and refrigeration machines, codes and standards in refrigeration systems, ideal and actual vapor-compressions refrigeration cycles, refrigerants, Single and multistage vapor refrigeration cycles, Gas refrigeration cycles, vapor absorption cycles, Thermoelectric vapor refrigeration cycles, Refrigeration cooling load calculations, Lubricant in refrigeration systems, Refrigerant piping and design, Control in refrigeration. Food storage and equipment (thermal properties of foods, cooling and freezing time of foods, commodity storage requirements)

Text Book

Basic Refrigeration and Air Conditioning by Ananthanarayanan, McGraw Hill, 2013.

EMM 402 Air Conditioning Systems 3 (2, 2, 1)

Prerequisite: EMM302 Thermodynamics II

Introduction, Psychometrics and moist air properties, air conditioning process, summer and winter air conditioning cycles, HVAC system classification – HVAC system analysis and selection, building air distribution and in-room terminal system. Basic central cooling and heating air conditioning system, decentralized cooling and heating, district cooling and heating systems. Air conditioning system for comfort application (residence, commercial and public, hotels, motels, education spaces, and health care facilities). Heating and cooling load calculations, Air distribution systems, Duct design, Chilled water piping network and piping design, Control in air conditioning systems.

Text Book

Basic Refrigeration and Air Conditioning by Ananthanarayanan, McGraw Hill, 2013.

EMM 403 Fluid Machinery 3 (2, 2, 1)

Prerequisite: EMM301 Fluid Mechanics II

Introduction to turbo machines (definition, basic equation, similarity analysis). Flow analysis (one-dimensional fluid flow in turbo machines, two dimensional cascades in turbo machinery, and three dimensional flow). Types of pumps, fans, turbines and compressors. Thermal and hydraulic design and analysis of pumps, fans, turbines and compressors. Component selection, system design and performance evaluations.

Text Book

Fundamentals of Turbo machinery William W. Peng Wiley

EMM 404 Low Current Distribution Systems 3 (2, 2, 1)

Prerequisite: EME208 Electric Circuits II

Fire Alarm Industry Codes and Standards, building, fire, and life safety codes, requirements for fire detection and alarm systems, NFPA 72 and design. introduction about Fire Alarm System, Type of Detectors, types of Call points, Manual Station, Break Glass, Alarms, Modules, Fire Alarm Control Panel F.A.C.P, cables and pipes network, Telephone System, Data Network, audio / video System, security system. Recognize general requirements for the inspection, testing, and maintenance of low current systems.

Text Book

-NFPA 72: National Fire Alarm and Signaling Code

-Egyptian Code

EME405 Automatic Control 3 (2, 2, 1)

Prerequisite: EMM304 Vibrations & System Dynamics

Introduction to control systems (definition, control terminology, control system configuration, classification of control systems, feedback control theory). Basic components of process control loops – Block diagram representation, transfer function, state space modeling, and signal flow graph. Transient response and steady-state accuracy. Stability. System analysis (root loci, frequency response: bode plot and polar plot) – Nyquist stability. Introduction to control system design

Text Book

Automatic Control Systems, by Farid Golnaraghi, Benjamin C. Kuo McGraw-Hill Education; 10th edition, 2017.

EMM406 Fire Fighting Systems 3 (2, 2, 1)

Prerequisite: EMM301 Fluid Mechanics II

Combustion and extinguishing theory for fire and explosion. Agents for fire extinguishing and flammability limits. Applicable Standards, Codes and Life Safety for firefighting system limitation, Fire Detection and Alarm System, Fire Fighting Systems, Manual Fire Fighting Systems (Portable Fire Extinguishers, Standpipe System, Fire Hydrant and Fire Department Connection), Automatic Fire Fighting Systems (Automatic Wet Suppression Systems, Automatic Dry Suppression Systems), Case Study and firefighting system design

Text Book

Fire Protection Systems, A. Maurice Jones Jr. Publisher: Jones & Bartlett Learning; 2nd edition, 2014.

EMM407 Plumbing Systems 3 (2, 2, 1)

Prerequisite: EMM301 Fluid Mechanics II

Types of water services in buildings and facilities. Codes and standards for water supply and drainage systems. Water demands estimation, Systems of domestic water circulation, sizing of domestic water storage and piping system, Domestic hot water system and heating capacity, Sanitary drainage system (single pipe system, two pipes system, plumbing fixtures and fixtures units, sizing of drainage water piping system, sump pits and sump pumps, Rainwater drainage system, Ventilation system.

Text Book

Plumbing Systems: Analysis, Design, and Construction by Tim Wentz Prentice Hall; 1st edition, 1996.

EMM408 Combustion and Engines 3 (2, 2, 1)

Prerequisite: EMM302 Thermodynamics II

Air standard cycles, Fuels-air cycles, and actual cycles, Reacting systems and thermo-chemistry. Theory of combustion: Heat of reaction, flame temperature and combustion products. Chemical equilibrium and reaction kinetics. Structure of flames and flame transmitting. Combustion in spark ignition/compression ignitions engines. Explosion and detonation. Fuel injection for diesel and spark ignition engines. Pollutant formation in combustion. Reduction of emission by modification of combustion parameters.– Emission control – Energy balance of engines – testing and performance maps.

Text Book

Turns, S. R., "An introduction to Combustion: concepts and applications", 2nd ed., McGraw-Hill Inc., 2000

EME409 Electric Power Distribution Systems I 3 (2, 2, 1)

Prerequisite:EME307 Electrical power systems

Introduction to Egyptian code, IEC&NEC standers, Load Estimation per Egyptian Code, design of indoor lighting system according to code by using DIALux program, design of outdoor lighting (streets/sports area), types/selection of circuit breaker, types /selection of low voltage cable, types /selection of normal and power sockets ,Cable Routing, Design of Panel Board (lighting /sockets) and wiring system.

Text Book

-IEC – ANSI/IEEE Standards

-Egyptian Code

-Protection of electrical networks by Christophe PREVE

-Technical guide MV/LV transformer substations - ABB / Schneider

EME410 Electric Power Distribution Systems II 3 (2, 2, 1)

Prerequisite: EME409 Electric Power Distribution Systems I

Low / Medium voltage distribution systems:(A.C., and D.C. systems, Ring main unit (R.M.U), medium voltage panels design, power factor Correction Types / design, medium voltage cables type /design Short Circuit Calculation, Voltage Drop Calculation, bus bar selection / design , medium /low voltage panels component design, Transformer sizing and Selection, Generator Sizing, Distributor, U.P.S types / selection, Earthling system for lightning and medium / low voltages design.

Text Book

-IEC – ANSI/IEEE Standards

-Egyptian Code

-Protection of electrical networks (Christophe PREVE)
-Technical guide MV/LV transformer substations - ABB / Schneider

EMM501 Process Control and Building Management Systems 3 (2, 1, 2)
Prerequisite: EME405 Automatic Control
Design of PI, PD, PID controllers, Design of servo system, Computers automations including PLCs, SCADA to control process, Process control in air conditioning systems, Firefighting systems, lighting systems and powers systems. Security and observation, Access control, Fire alarm system, Lifts, elevators etc., Plumbing, Closed-circuit television (CCTV), Other engineering systems, Control Panel, PA system, Alarm Monitor, Security Automation
Text Book
Modern Control Engineering, by Katshuhiko Ogata Pearson; 5th edition, 2009.

EME502 Electrical machines 3 (2, 2, 2)
Prerequisite: EME208 Electric Circuits II
Magnetic circuits, energy conversion, one phase and three phase transformers, EMF and MMF equations, DC machines analysis, construction and principles, Single phase induction motors. Three-phase Induction machines (construction, principles, equivalent circuits, torque speed characteristics, parameters determination, soft start, induction generator... etc). Synchronous machines (construction, principles, equivalent circuits, starting, power angle, parameters determination, parallel operations of alternators...etc). Speed control.
Text Book
Electric machines by Charles and Hubert.

EMM503 Refrigerators and AC Systems and Equipment 3 (2, 1, 2)
Prerequisite: EMM 401 Refrigeration, EMM 402 Air Conditioning Systems
Air conditioning systems and classifications, Air terminal units (air handling units, fan coil units), Sections of air handling units (filters, cooling and dehumidifying coils, heating coils, Humidifiers, Fans), Chillers (air cooled chillers, water cooled chillers, cooling towers), condensing units and its components, Desiccant dehumidifiers, Chilled water networks and pumps, energy recovery systems, expansion devices, unitary air conditioning units.
Text Book
Basic Refrigeration and Air Conditioning by Ananthanarayanan McGraw Hill, 2013.

EME504 Computer Applications in ElectroMechanical Systems 3 (2, 1, 2)
Prerequisite: EMM 402 Air Conditioning Systems, EME409 Electric Power Distribution Systems I
Computers software in air conditioning systems, Cooling load calculations software, Air duct design software, water networks and hydronics systems software, hydraulic calculations software for firefighting systems, lighting distributions software, electric power software, recent soft wears in electromechanical systems.
Text Book
Nonlinear Control and Filtering Using Differential Flatness Approaches: Applications to Electromechanical Systems by Gerasimos G. Rigatos , Springer; 2015.

Elective Courses

Elective 1: Students shall select one course from the following three alternatives

EME505 Renewable Energy **3 (2, 2, 1)**

Prerequisite: EMM206 Thermodynamics I

Introduction to the broad range of renewable alternative energy systems available to relieve and reduce the use of pollution-producing fossil fuel-based energy systems in construction and transportation. Covers description and basic operation principles of Solar, Wind, Geothermal, Hydro Power, Biomass and Fuel Cells. Presents the advantages and disadvantages of each of the renewable energy systems and advantages of integrating these systems into usable power. Practical applications for renewable systems will be discussed in class lectures and further illustrated with hands-on laboratory backup experiments and field trip examples.

Text Book

Renewable Energy: Power for a Sustainable Future, by Godfrey Boyle Oxford University Press; 2nd edition, 2004.

EME507 Elevators and Escalators **3 (2, 1, 2)**

Overview of elevators and escalators aspects, Planning and traffic analysis aspects, User safety aspects, Public service elevators and escalators, locations components, operation and method of installation, commercial elevators and escalators. Anatomy of an escalators:: step; Drive, step chain, lubricant free step chain; carriage, tracking system, safety benchmarking study. Planning: suitability for location, arrangements, width of step, internal/external drive, pit dimensions, angle of incline. Electrical systems: Safety devices, design principles, motor sizing and selection, drives, methods of starting, stopping and slowing down. Elevator and escalators backing.

Text Book

Vertical transportation: elevators and escalators by George R. Strakosch, Wiley, 2nd Edition, 1983.

EMM509 Solar Thermal and PV Systems **3 (2, 2, 1)**

Prerequisite: EMM305 Heat Transfer

Solar energy (solar radiation intensity, angles, estimations and measurements), Solar energy systems, solar thermal collectors, solar water heaters, solar thermal power generation, Photo voltic cells operation and efficiency, PV solar power system, Solar energy storage systems. , Design/selection of PV cell , inverter type, meters , measurement / monitoring devices , AC/DC protection device & AC/DC cables.

Text Book

Solar Energy: The Physics and Engineering of Photovoltaic Conversion, Technologies and Systems by Olindo Isabella, Klaus Jäger , Arno Smets, René van Swaaij, Miro Zeman , UIT Cambridge Ltd, 2016

Elective 2: Students shall select one course from the following three alternatives

EME506 Advanced Industrial Electronics **3 (2, 2, 1)**

Prerequisite:EME306 Electronic Devices and Circuits

Semiconductors diodes and Diodes applications, Resonant converters. Feedback and oscillator circuit, Power supply applications. Two terminal devices, Residential and industrial applications. Electric utility applications. Practical converter design considerations, operational and power amplifiers, .

Text Book
Electronic Devices and Circuit Theory by Robert L. Boylestad, : Louis Nashelsky, Pearson 11th edition, 2013.

EME508 Communications Engineering 3 (2, 2, 1)
Prerequisite: EMM 404 Low Current Distribution Systems
Signals and systems, Fourier transforms of signals and systems, Complex representation of base-band signals, Hilbert transform Band-pass signal representation, Analog Modulation, Amplitude Modulation, AM detectors, Frequency Modulation, FM detectors, Noise performance in analog modulation, Sampling Theory Pulse Modulation, PAM, PPM, PWM. Digital pass-band modulation, PSK, FSK, ASK, QAM, Coherent and non-coherent modulation, Bandwidth efficiency of digital modulated signal, Power spectra of digital modulated signal, noise performance in digital modulation.
Text Book
Communication systems", by Simon Haykin, John wiely & sons, New York

EME510 Electrostatic and Electromagnetic fields 3 (2, 2, 1)
Prerequisite: EME208 Electric Circuits II
Applications of Electromagnetic Field Theory , Differences between Circuit Theory and Electromagnetic Field Theory, Mathematical Preliminaries and Vector analysis. Electrostatic Fields Static electric fields. Steady electric currents. Static magnetic field. Varying fields and Maxwell's equations Electromagnetic Fields and Waves, Guided Waves, Transmission Lines, Radiation and Antennas.
Text Book
Electromagnetic Field Theory and Transmission Lines by G. S. N. Raju, Pearson India, June 2006.

Elective 3: Students shall select one course from the following three alternatives

EME506 Electro-Hydraulic Circuits 3 (2, 2, 1)
Prerequisite: EMM501 Process Control and Building Management Systems
Basic and components of hydraulic power systems, Hydraulic pumps, Hydraulic fluids, hydraulic valves, lines, fittings and seal, hydraulic modeling and simulation, hydraulic circuit design, hydrostatic transmission, Dynamic modeling and simulation, electric components, electro-hydraulic switches and switching circuitry, proportional and servo hydraulics, PLCs and hydraulic power.
Text Book
Fluid Power Engineering by M Rabie McGraw-Hill Education; 1st edition, 2009.

EME508 Codes and Specifications of ElectroMechanical Systems 3 (2, 2, 1)
International standards, IEC standards regarding the main specifications, testing, inspection and commissioning of electrical equipment and drives. Firefighting system international codes and standards, NFPE, HVAC codes and standards, International building codes, Plumbing codes.
Text Book
Egyptian local codes, NFPA codes, NEC codes, ASHAREA codes and standards, International building codes.

EME510 Computer Networks **3 (2, 2, 1)**

Computer network architectures, protocol types (e.g. TCP/IP and OSI), Protocols Layers, network programming. Transmission media, encoding systems, circuit and packet switching, multiple access arbitration. Network routing, congestion control, flow control. Transport protocols, real-time, multicast, network security. Laboratory: Design, apply, analyze, and evaluate communication network protocols under Linux or Windows NT operating systems. Emphasis on identifying problems, proposing alternative solutions, implementing prototypes using available network protocols and evaluating results.

Text Book

Computer Networks", by Andrew S. Tanenbaum, 5th ed., Prentice Hall, 2011.

Elective 4: Students shall select one course from the following three alternatives

EMM512 Cold Stores and Industrial Refrigeration **3 (2, 2, 1)**

Prerequisite: EMM 401 Refrigeration

Food storage and equipment, cooling and freezing times of food, food microbiology and refrigeration, refrigeration load, refrigerated facilities design, methods of precooling fruits, vegetables and cut flowers, industrial food freezing system, meat, poultry and fishery products, industrial applications (ice manufacturing, refrigeration in the chemical industries, low temperature applications and Cryogenics).

Text Book

Handbook of Air Conditioning and Refrigeration by Shan K. Wang, McGraw Hills, 2 Edition, 2016

EMM516 Automotive Engineering **3(2, 2, 1)**

Prerequisite: EMM408 Combustion and Engines

Engine and associated systems (fuel, ignition, cooling, lubrication). Turbocharging. Transmission. Steering. Braking. Suspension. Emission-control systems. Recent advances. Thermodynamic analysis of fuel-air cycles. Combustion charts. Chemical equilibrium and dissociation. Control of exhaust emissions. Engine friction. Heat transfer. Engine energy balance. Testing and performance maps.

Text Book

Automotive Engineering Fundamentals by Jeffrey K. Ball, Richard Stone, SAE International, ISBN 978-0-7680-0987-3, 2004.

EMM518 Thermal power Stations **3(2, 2, 1)**

Prerequisite: EMM302 Thermodynamics II

Introduction, a steam power cycles review, steam generators, steam generator controls, soot blowing and blow down, boiler materials, fuel system, reduction of emissions. Steam Turbines, Condensers, Cooling Towers, Combined cycles plants, heat recovery generators. Course Project.

Text Book

Thermal Power Plant , Design and operation by Dipak Sarkar, Elsevier, 1st Edition, ISBN:9780128017555, 2015

EMM/E521 Project **3 (3, 0, 1)**

EMM/E522 Project **3 (3, 0, 1)**

The student deals with the analysis and design of a complete engineering project using the fundamentals, principles and skills he gained during his study. The project report presented by

the student should include the details of the analysis and design satisfying the concerned codes requirements, the computer applications as well as the experimental work when necessary, in addition to the technical engineering drawing of his design. The project report is to be submitted and discussed by the end of the project. The student should prove his complete understanding of the elements of the project and his capability to apply them in his future engineering.