مقدمـــة

أنشئت كلية التقنية الصناعية (المعهد العالي للصناعة سابقا) لتحقيق أهداف عديدة ترمي لرفع كفاءة العاملين بقطاع الصناعة والقطاعات الأخرى ذات العلاقة، ونشر الوعي التقني بين أفراد المجتمع. واهتمت الكلية خلال السنوات الأولى من إنشائها ببرنامج الدراسة والبحث العلمي لتخريج الكوادر ذات المستوى الجامعي والتقني، بالإضافة إلى تأهيل ورفع كفاءة العاملين بالقطاعات المختلفة من خلال عقد الدورات التدريبية في المجالات المختلفة.

ونتيجة لنجاح برنامج الدراسات في مرحلة البكالوريوس بالكلية، وللحاجة الملحة لحملة الشهادات العليا (الماجستير) في المجالات المختلفة، وللمساعدة في دراسة العديد من المواضيع وإعداد بحوث خاصة بها، فقد بدأت الكلية عام 1995م في تنفيذ برنامج الدراسات العليا لنيل درجة الماجستير التقني. ولتجنب تشتت الجهود، وحتى يتم تنفيذ البرنامج بأقل ما يمكن من الصعوبات، فقد اتبعت الكلية نظام المجموعات، وذلك بفتح الدراسات العليا في تخصص واحد في نفس الوقت، والذي يتم توفير الاحتياجات المادية له.
وعلى هذا الأساس شرعت الكلية في تنفيذ البرنامج في تخصص الهندسة الصناعية بعد أن توفر بالكلية العدد الكافي من الأساتذة لتدريس المقررات والإشراف على الرسائل، مع الاستعانة بأعضاء هيئة التدريس بالجامعات الليبية والمعاهد العليا للمساعدة في الإشراف. فانخرط بالبرنامج أكثر من (70) مهندساً، وقد تحصل عدد (36) منهم على مؤهل الماجستير التقني.

ونظراً لنجاح برنامج الدراسات العليا في تخصص الهندسة الصناعية، شرعت الكلية خلال العام الدراسي 2004/2003 في برنامج الدراسات العليا في تخصص الهندسة الكهربية والالكترونية في شعبة هندسة التحكم الآلي وهندسة الحاسوب وهندسة الاتصالات، وانخرط بالبرنامج أكثر من (55) مهندساً ، وقد تحصل عدد (11) منهم على مؤهل الماجستير التقني.
وقعت الكلية سنة 2007م اتفاقية تعاون مع جامعة جلاسكو وجامعة نوتنجهام ترنت البريطانيتين في برنامج الدراسات العليا في تخصص الهندسة الالكترونية في شعبتي هندسة الحاسوب وهندسة الاتصالات، حيث تم إيفاد عدد من الطلبة منذ توقيع الاتفاقية وقد تخرج حتى نهاية الفصل الدراسي خريف 2015/2014 عدد (30) طالباً ولايزال هذا البرنامج المشترك مستمراً إلى وقتنا الحاضر.
وقد تحصل على مؤهل الماجستير التقني من الكلية حتى نهاية الفصل الدراسي خريف 2015/2014 سبعة وسبعون (77) طالباً وطالبة والجداول رقم (1) ،(2) و(3) المرفقة في نهاية هذا الكتيب تعرض أسماء وتخصصات الخريجين وسنة التخرج.

شعار- رؤية – رسالة - أهـداف الكليـة

شعار الكلية

التعليم التقني بين يديك

رؤية الكلية

نسعى لأن نكون مؤسسة أكاديمية، تقنية،بحثية، استشارية،تدريبية في المجالات الهندسية، وبمخرجات تناسب احتياجات سوق العمل، ولها حضور محلي وإقليمي متميز.

رسالة الكلية

الإسهام الفاعل في تأهيل، وتنمية، وتطوير الموارد البشرية ذات الكفاءة للمؤسسات الإنتاجية والخدمية، من خلال البرامج التعليمية، والبحثية، والتدريبية.

أهـــداف الكليـــة

تهدف الكلية لتحقيق التالي:

1. إعداد الخبرات الوطنية، والاعتماد عليها في تطوير الإمكانيات التقنية، والهندسية.
2. رفع كفاءة العناصر البشرية في المجالات العلمية.
3. العمل على إقامة وتوثيق الصلات مع المؤسسات العلمية المماثلة في العالم.
4. المساهمة في حل المشاكل التقنية التي تواجه القطاعات الإنتاجية، والخدمية.
5. إقامة وتنظيم المؤتمرات العلمية.

شروط القبول

يشترط للقبول ببرنامج الدراسات العليا ما يلي:

1. أن يكون مستوفياً لشروط اللياقة الصحية والبدنية.
2. أن يقوم بتقديم جميع المستندات المطلوبة.
3. أن يجتاز الاختبار الشخصي أو أي اختبارات أخرى تحددها إدارة الكلية.
4. التعهد بدفع المصاريف الدراسية المقررة وبالطريقة التي تحددها اللوائح والقرارات المنظمة لسير العمل بالكلية.
5. أن يكون مستوفياً لأية شروط تحددها اللوائح المعمول بها بالكلية، أو تقررها وزارة التعليم العالي والبحث العلمي.
6. أن يكون الطالب حاصلا على درجة البكالوريوس التقني من إحدى الكليات التقنية أو مايعادلها أو درجة البكالوريوس في الهندسة من احدى الكليات الجامعية بتقدير عام "جيد" على الأقل، وفي نفس المجال.
7. لا يتم تسجيل الطالب بالدراسات العليا بشكل رسمي إلا بعد اجتيازه لامتحان اللغة الانجليزية المعتمد بالكلية، حيث أن درجة النجاح للطلبة الدارسين بالداخل 50% وللطلبة الدارسين باتفاقيات التعاون المشترك 65%.
8. أن يتحصل الطالب على موافقة جهة العمل بالنسبة للعاملين للتفرغ للدراسة جزئياً أو كلياً.

نظام الدراسة

1. تمنح كلية التقنية الصناعية مؤهل "الماجستير التقني" في المجالات الهندسية لمن يستكمل متطلبات هذا المؤهل.
2. تنقسم مدة الدراسة لنيل الإجازة العالية "الماجستير التقني" إلى مرحلتين هما المرحلة الأولى، ومرحلة إعداد الرسالة على النحو التالي:

أ. المرحلة الأولى(مرحلة انجاز المقررات الدراسية): وتبدأ منذ بداية تسجيل الطالب في الدراسات العليا إلى حين إنجازه لجميع المقررات الإجبارية والاختيارية المطلوبة.

ب. مرحلة إعداد الرسالة: وتبدأ بعد إتمام المرحلة الأولى وحتى مناقشة الرسالة، ويقوم الطالب بتقديم مقترح الرسالة وفق الضوابط المنصوص عليها في هذه اللائحة.

3. تكون الدراسة وفقاً لنظام الفصول الدراسية بواقع فصلين دراسيين في العام الدراسي.

4. تتم إجراءات التسجيل لكل فصل دراسي خلال الأسبوع السابق لبدء الدراسة، ولا يعتمد التسجيل إلا إذا كان على النموذج الخاص بذلك ووفق الإجراءات التي تحددها إدارة الكلية.

5. لا يجوز للطالب تسجيل مقررات دراسية خلال الفصل الدراسي الواحد بأقل من الحد الأدنى (6 وحدات دراسة) ولا أكثر من الحد الأقصى (12 وحدة دراسية) المسموح بها، إلا في حالة عدم توفر مقررات دراسية كافية في الفصل الدراسي.

6. يسمح بتعديل التسجيل بالحذف والإضافة خلال أسبوعين من بدء الدراسة، وبالحذف لمقرر واحد خلال ثمانية أسابيع من بدء الدراسة بشرط موافقة قسم الدراسات العليا.

7. يعتبر الطالب ناجحاً في المقرر الدراسي متى تحصّل على نسبة 65% فأكثر.

8. يقوم كل طالب بتقديم بحث "رسالة" في نهاية دراسته وفق البرنامج الذي تحدده إدارة الكلية.

9. يخضع برنامج الدراسات العليا المشترك للكلية مع جامعات دولية لبنود الاتفاقيات المبرمة.

المستندات المطلوبة

1. نموذج طلب قبول ببرنامج الدراسات العليا، معبأ من قبل الطالب.
2. صورة طبق الأصل من مؤهل البكالوريوس وكشف درجات معتمدة من الجهة المختصة.
3. شهادة خلو من السوابق.
4. شهادة صحية.
5. صورة من البطاقة الشخصية وجواز السفر ساري المفعول.
6. أربع صور شخصية.
7. شهادة وضع عائلي والرقم الوطني.

الإنذارات والفرص الدراسية

1- يوجه للطالب إنذار في الحالات التالية:

أ. إذا رسب في مقررين دراسيين

ب. إذا رسب في نفس المقرر مرتين.

ج. إذا تحصل على معدل عام (تراكمي) يقل عن الحد الأدنى المقرر (65%).

د. إذا أخفق في أن تجاز رسالته.

2- يفصل الطالب في إحدى الحالات التالية:

أ. إذا تحصل على ثلاثة إنذارات.

ب. إذا ثبتت عدم أمانته العلمية، وتسحب منه الإجازة العلمية إذا كان قد سبق منحها له.

ج. إذا انقطع عن الدراسة لمدة فصلين دراسيين دون عذر يقبله قسم الدراسات العليا.

د. إذا أخفق في أن تجاز رسالته للمرة الثانية.

المقررات المطلوبة

أولاً: مقررات قسم الهندسة الصناعية
Industrial Engineering Department

1- مقررات عامة للقسم (مقررات اساسية أو إجبارية) (18 وحدة)

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	IE1001 ت.ص1001	Probabilistic Models نماذج احتمالية	3
2	IE1002 ت.ص1002	Opreation Research I بحوث عمليات 1	3
3	IE1003 ت.ص1003	Opreation Research II بحوث عمليات 2	3
4	IE1004 ت.ص1004	Optimization Techniques تقنيات اختيار الأمثل	3
5	IE1005 ت.ص1005	Simulation محاكاة	3
6	IE1006 ت.ص1006	Facility Design تخطيط مصانع	3

2- مقررات تخصصية لكل شعبة اختيارية (9 وحدات)

أ- مقررات شعبة الإنتاج وضبط الجودة (يختار منها الطالب ثلاثة مقررات) (9 وحدات)
Production and Quality Control Division

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	IE1101 ت.ص1101	Flexible Manufacturing System (FMS) نظام التصنيع المرن	3
2	IE1102 ت.ص1102	Quality and Reliability Engineering هندسة الجودة والموثوقية	3
3	IE1103 ت.ص1103	Product Design and Development تصميم وتطوير المنتج	3
4	IE1104 ت.ص1104	Design of Experiments (DOE) تصميم التجارب	3
5	IE1105 ت.ص1105	Selected Topics in Production and Quality Control مواضيع مختارة في الإنتاج وضبط الجودة	3

ب- مقررات شعبة الإدارة الصناعية (يختار منها الطالب ثلاثة مقررات) (9 وحدات)

Industrial Management Division

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	IE1201 ت.ص1201	Forcasting Models نماذج التنبؤ	3
2	IE1202 ت.ص1202	Investment Decision Making اتخاذ القرار الاستثماري	3
3	IE1203 ت.ص1203	Supply Chain Management إدارة سلسلة التوريد	3
4	IE1204 ت.ص1204	Inventory Models نماذج المخزون	3
5	IE1205 ت.ص1205	Selected Topics in Industrial Management مواضيع مختارة في الإدارة الصناعية	3

3- رسالة (Thesis)

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	IE1020 ت.ص1020	Thesis رسالة	-

ثانياً: مقررات قسم الهندسة الإلكترونية

Electronic Engineering Department

1- مقررات عامة للقسم (21 وحدة)

أ- مقررات اساسية أو إجبارية (15 وحدة)

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	EE2001 ت.أ2001	Applied Numerical Methods طرق عددية تطبيقية	3
2	EE2002 ت.أ2002	Digital Signal Processing (DSP) معالجة الإشارة الرقمية	3
3	EE2003 ت.أ2003	Modeling and Simulation نمذجة ومحاكاة	3
4	EE2004 ت.أ2004	Data Communication and Computer Networks اتصالات بيانات وشبكات حاسوب	3
5	EE2005 ت.أ2005	Engineering Statistics and Probability إحصاء واحتمالات	3

ب. مقررات اختيارية (يختار منها الطالب مقررين) (6 وحدات)

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	EE2006 ت.أ2006	Engineering Management إدارة هندسية	3
2	EE2007 ت.أ2007	Advanced Electronic Circuits دوائر الكترونية متقدمة	3
3	EE2008 ت.أ2008	Network Security أمن الشبكات	3
4	EE2009 ت.أ2009	Applied Industrial Processing Control التحكم في العمليات الصناعية التطبيقية	3
5	EE2010 ت.أ2010	Wireless Communication اتصالات لاسلكية	3

2- مقررات تخصصية لكل شعبة (6 وحدات)

أ- مقررات شعبة الحاسوب (يختار منها الطالب مقررين) (6 وحدات)

Computer Division

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	EE2101 ت.أ2101	Digital Image Processing معالجة الصور الرقمية	3
2	EE2102 ت.أ2102	Advanced Digital System Design تصميم الأنظمة الرقمية المتقدمة	3
3	EE2103 ت.أ2103	Microprocessor and Embedded Systems المعالجات الدقيقة والانظمة المدمجة	3
4	EE2104 ت.أ2104	Performance Evaluation of Computer Systems تقييم أداء أنظمة الحاسوب	3
5	EE2105 ت.أ2105	Software Engineering هندسة البرمجيات	3
6	EE2106 ت.أ2106	Advanced Operating Systems أنظمة التشغيل المتقدمة	3
7	EE2107 ت.أ2107	Computer Architecture and Parallel Processing معمارية الحاسوب والمعالجة المتوازية	3
8	EE2108 ت.أ2108	Selected Topics in Computers مواضيع مختارة في الحاسبات	3

ب–مقررات شعبة الاتصالات (يختار منها الطالب مقررين) (6 وحدات)

Communication Division

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	EE2201 ت.أ2201	Random Variables and Stochastic Processes المتغيرات والعمليات العشوائية	3
2	EE2202 ت.أ2202	Information Theory and Coding نظرية المعلومات والتشفير	3
3	EE2203 ت.أ2203	Communication System Design تصميم انظمة الاتصالات	3
4	EE2204 ت.أ2204	Spread Spectrum Communication اتصالات نشر الطيف	3
5	EE2205 ت.أ2205	Optical Communication Systems نظم الاتصالات البصرية	3
6	EE2206 ت.أ2206	Microwave Theory and Antenna Design نظرية الموجات الدقيقة وتصميم الهوائيات	3
7	EE2207 ت.أ2207	Data Transmission نقل البيانات	3
8	EE2208 ت.أ2208	Broad Band Communication Networks شبكات الاتصالات عريضة الحزمة	3
9	EE2209 ت.أ2209	Next Generation Networks شبكات الجيل التالي	3
10	EE2210 ت.أ2210	Selected Topics in Communications مواضيع مختارة في الاتصالات	3

3- رسالة (Thesis)

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	EE2020 ت.أ2020	Thesis رسالة	-

ثالثاً: مقررات قسم الهندسة الكهروميكانيكية
Electromechanical Engineering Department

1- مقررات عامة للقسم (مقررات إجبارية) (9 وحدات)

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	EE2001 ت.أ2001	Applied Numerical Methods طرق عددية تطبيقية	3
2	EE2002 ت.أ2002	Digital Signal Processing (DSP) معالجة الاشارة الرقمية	3
3	EE2003 ت.أ2003	Modeling and Simulation نمذجة ومحاكاة	3

2- مقررات تخصصية لكل شعبة اجبارية (12 وحدة)

أ- مقررات اجبارية شعبة نظم القوى الكهربائية (12 وحدة)

Electrical Power System Division

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	EM3101 ت.ك3101	Advanced Power Electronics الكترونات قوى متقدمة	3
2	EM3102 ت.ك3102	Advanced Power System Analysis تحليل نظم قوى متقدم	3
3	EM3103 ت.ك3103	Analysis of Electrical Machines تحليل آلات كهربائية	3
4	EM3104 ت.ك3104	High Voltage and Insulation Systems الجهد العالي وأنظمة العزل	3

ب- مقررات اجبارية شعبة التحكم (12 وحدة)

Control Division

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	EM3201 ت.ك3201	Advanced Control System نظم تحكم متقدم	3
2	EM3202 ت.ك3202	System Identification and Estimation تحديد وتقدير النظم	3
3	EM3203 ت.ك3203	Optimal Control التحكم الأمثل	3
4	IE1004 ت.ص1004	Optimization Techniques تقنيات اختيار الأمثل	3

3- مقررات تخصصية لجميع الشعب اختيارية (يختار منها الطالب مقررين) (6 وحدات)

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	EM3001 ت.ك3001	Control and Operation of Electric Power System التحكم والتشغيل في نظم القوى الكهربائية	3
2	EM3002 ت.ك3002	Renewable Power Generation توليد الطاقة المتجددة	3
3	EM3003 ت.ك3003	Protection Devices and Systems أجهزة ونظم الحماية	3
4	EM3004 ت.ك3004	Power Systems Operations and Economics أداء واقتصاديات نظم القوى	3
5	EM3005 ت.ك3005	Power Systems Reliability موثوقية نظم القوى	3
6	EM3006 ت.ك3006	Power Systems Planning تخطيط نظم القوى	3
7	EM3007 ت.ك3007	Electrical Energy Distribution توزيع الطاقة الكهربائية	3
8	EM3008 ت.ك3008	Electrical Machines and Drives الآلات الكهربائية والمسوقات	3
9	EM3009 ت.ك3009	Multivariable Control System Design تصميم نظم التحكم متعدد المتغيرات	3
10	EM3010 ت.ك3010	Adaptive Control التحكم في التكيف	3
11	EM3011 ت.ك3011	Electric Power System Quality جودة نظم القوى الكهربائية	3
12	EM3012 ت.ك3012	Nonlinear Control التحكم غير الخطي	3
13	EM3113 ت.ك3113	Selected Topics in Power Systems مواضيع مختارة في نظم القوى	3
14	EM3214 ت.ك3214	Selected Topics in Control مواضيع مختارة في التحكم	3

4- رسالة (Thesis)

ر.م No.	رمز المقرر Code	اسم المقرر Subject	الوحدات Units
1	EM3020 ت.ك3020	Thesis رسالة	-

مفردات المقررات :

أولاً: مقررات قسم الهندسة الصناعية

3 Units	Probabilistic Models	IE1001

Random variables: Distribution functions, Discrete random variables and probability density functions, Continuous random variables and probability density functions, Mean and variance, Conditional distributions. Multiple random variables: Bivariate random variables, Joint distribution functions, Discrete random variables, Joint probability mass density functions, Continuous random variables, Conditional distributions, Covariance and correlation coefficient, Conditional means and conditional variance. Functions of random variables: Functions of one random variable, Function of two random variables, Function of *n* random variables, Expectation, Moment generating functions. Random process: Classification of random process, Introduction to discrete Markov chains. At the end of the course, the students are expected to be able to apply Probabilistic Models to solve problems in engineering and using computer packages such as SPSS, R programming and Excel spread sheets.

3 Units	Operation Research I	IE1002

Integer programming: mixed integer programming: BIN-integer programming. Dynamic programming: Deterministic dynamic programming, Probabilistic dynamic programming. Network models: Terminology of networks, The minimum spanning tree problem, The maximum flow problem, The minimum cost flow problem, CPM and PERT including cost and limited resources considerations, updating PERT/CPM. Game theory: Two person zero sum games, Games without saddle points (mixed strategies), Methods for solving general game-graphical-linear programming. Decision analysis: Max, min, Min max criterion, Decision making under risk, Expected monetary value (EMV), Expected opportunity loss (EOL), Expected value of perfect information (EVPI), Expected value criterion for continuously random variables, Steps in decision tree analysis-Bayesian approach in decision making. At the end of the course, the students are expected to be able to apply the concepts of the previous models and to use computer packages such as Lingo, R programming, MPL/Cplex, Excel spread sheets to solve IE operation research problems.

3 Units	Operation Research II	IE1003

Sequencing models: sequencing *n* jobs on m machines, Palmer algorithm, Gupta algorithm, Combel Dech and Smith (CDS) algorithm. Nonlinear programming: Basic concepts, Types of nonlinear programming problems: One-variable unconstrained optimization, Multivariable unconstrained optimization, The Karush-Kuhn-Tucker (KKT), Conditions for constrained optimization, Quadratic programming, Separable programming, Convex programming, Non-convex programming. Markov chains: Discrete time Markov chains, Transition matrix, Steady state probability, Classification of states, First passage time, Continuous Markov chains, Birth and death process. Queuing theory: Infinite and finite

queues: (M/M/1): (∞/FCFS) (Single server, Unlimited queue), (M/M/C): (∞/FCFS) (Single server, Finite queue). (M/E/1) (∞/FCFS) (Erlang family distribution). (M/M/R) (Machine repair problem). (D/D/1) (Deterministic model). (M/D/I) (Deterministic models). (M/G/1): (∞/FCFS) (Deterministic models). Queuing networks. At the end of the course, the students are expected to be able to apply the concepts of the previous models and using computer packages such as Lingo, R programming, MPL/Cplex, Excel spread sheets to formulate and solve different problems in IE and OR.

3 Units	Optimization Techniques	IE1004

Introduction to metaheuristics. Hill climbing: Introduction, Mathematical description, Local and global maxima, Ridges, Plateau, Pseudo-code, Applications. Simulated annealing (SA): Introduction, Annealing schedule, Pseudo-code, Parameter selection, Application of SA. Genetic algorithm (GA): Introduction, Biological background, Genetic representation, Initialization and selection, Operators in GA, GA algorithm, Classification of GA, Application of GA. Fuzzy logic: An introduction to fuzzy logic, Operations on fuzzy sets, Fuzzy relations, The theory of approximate reasoning, An introduction to fuzzy logic controllers, Aggregation in fuzzy system modeling, Fuzzy screening, Application of fuzzy systems. Ant colony optimization (ACO): Introduction, From real to artificial ants, Theoretical considerations, Convergence proofs, ACO algorithm, ACO and model based search, Application principles of ACO. Particle swarm optimization (PSO): Introduction, Principles of bird flocking and fish schooling, Evolution of PSO, Operating principles, PSO Algorithm, Neighborhood topologies, Convergence criteria, Application of PSO. At the end of the course, the students are expected to be able to solve NP-hard problems such as Travelling salesman problem, Quadratic assignment problems (QAP), Allocation problems and supply chain management problems.

3 Units	Simulation	IE1005

Introduction to simulation, Design of simulation models. Monte Carlo simulation: Basic steps in the procedure of Monte Carlo simulation. Pseudo random numbers: Generation of random deviates, Techniques for generating random variables: Inverse transform method, the rejection techniques(beta, gamma, exponential) deviates, The Box and Muller, Special probability distributions: F, Chi square distributions, Testing a random number generator: KS test, Chi test. Examples of hand simulation: Queuing models, Inventory models. Analysis simulation output: Point estimation, Variance reduction, Interval confidence, Comparison and evaluation of alternative system designs. Monte Carlo Markov chains (MCMC) simulation: Application of MCMC algorithms: Metropolis hasting. At the end of the course, the students are expected to be able to develop simulation models with the use of GPSS for inventory systems, queuing systems and project network. The students are also able to apply MCMC with R programming for solving and evaluating one and multidimensional integrals.

3 Units	Facility Design	IE1006

Introduction to facility design, Process and material flow analysis, Systematic layout planning (SLP). Basic algorithms and software for the layout problem. Models for the layout problem: Single-row layout modeling, Quadratic assignment problem (QAP) model. Advanced layout algorithms: Branch and bound, Benders decomposition. Example for material handling system (MHS)_Selection and assignment. Basic models for the location problem: Techniques for discrete and continuous space: Single facility location problem with squared and Euclidean distances. Advanced location models: Multiple facility problems with rectilinear and Euclidean distances. Allocation models: Network flow model, Two-stage transportation model, Vehicle routing problem. Location-allocation models: Set covering model: Uncapicated location-allocation model, Comprehensive location-allocation model. At the end of the course, the students are expected to be able to develop their own algorithms and use of computer packages such as Lingo, Cplex, Plan OPT and Metaheuristics for finding the optimal and near optimal solutions of the previous NP-hard optimization problems.

3 Units	Flexible Manufacturing System (FMS)	IE1101

Automation: Types of automation, Reasons for automating, Automation strategies. Detroit type automation: Automated flow lines, Methods of work part transport, Transfer mechanisms, Buffer storage, Automation for machining operations. Automated assembly systems: Design for automated assembly, Types of automated assembly systems, Part feeding devices, Quantitative analysis of the delivery system operation, Analysis of a single station assembly machine, Numerical. Group technology: Part families, Part classification and coding, Types of classification and coding systems. Machine cell design: The composite part concept, Types of cell designs, Determining the best machine arrangement, Benefits of group technology. Flexible manufacturing systems: Components of an FMS, Types of systems, Where to apply FMS technology, FMS work stations. Material handling and storage system: Functions of handling system, FMS layout configurations, Material handling equipment. Computer control system: Computer function, FMS data file, System reports, Planning the FMS, Analysis methods for FMS, Application and benefits. Robotic technology: Joints and links, Common robot configurations, Work volume, Types of robot control, Accuracy and repeatability, Other specifications, End effectors, Sensors in robotics. Robot programming: Types of programming, Lead trough programming, Motion programming, Interlocks, Advantages and disadvantages. Robot languages: Motion programming, Simulation and off-line programming, Work cell control. Robot application: Characteristics of robot applications, Robot cell design. Types of robot applications: Material handling, Processing operations, assembly and inspection. At the end of the course, the students are expected to be able to understand the role of **FMS** in the field of manufacturing, the concept of technology group and cellular manufacturing systems, the benefits of automation in manufacturing industries, and to be familiar with the organization and processing of information in the field of manufacturing.

3 Units **Quality and Reliability Engineering** **IE1102**

Quality engineering: Concepts of quality engineering, Taguchi's approach to quality, On-line and off-line quality control, Difference from classical approach, Quality loss function, System design, Parameter design, Tolerance design, Causes of variation, Classification of parameters, Parameter design strategy. Steps in robust design, Quality characteristics and objective functions, Control factors and their levels, Noise factors and testing conditions, Planning and conducting the experiment. Response surface methodology, First order and second order models, Crossed array experiments, Single to noise ratios. Reliability engineering: The reliability function, Failure rate, Hazard rate, Bath-tub curve, Relationships between various characteristics, Component reliability, Mean time to failure, Time dependent hazard models, Constant hazard, Linear hazard, Nonlinear hazard and Gamma models. System reliability, Two state modeling, Series modeling, Parallel modeling, Series-parallel and parallel-series models, *k*-out-of-*m* models, Standby models, Non-series-parallel models, Fault tree approach to system modeling. Maintained systems: Classification of maintenance activities: Breakdown, Preventive and predicative maintenance, Condition monitoring, Maintainability and availability, Reliability centered maintenance. At the end of the course, the students are expected to be able to calculate failure rates, MTTF, including confidence limit, be able to build system-level quality and reliability models from component-level models, design a statistical manufacturing monitor/ control chart with specified producer and customer risk levels, and handle large datasets using Excel or any computer packages.

3 Units **Product Design and Development** **IE1103**

Introduction: Need, Benefits, Concepts of product life cycle. Components/Elements of product life cycle management (PLM), Significance of PLM, Customer involvement. Product life cycle environment: Product data and product workflow, Company's PLM vision, The PLM strategy, Strategy identification and selection, Change management for PLM. Product development process and methodologies: Integrated product development process: Conceive, Specification, Concept design, Design, Detailed design, Validation and analysis (simulation), Tool design, Realize, Plan manufacturing, Manufacture, Build/ Assemble, Test (quality check), Service: Sell and deliver, Use, Maintain and support, Dispose. Bottom-up design, Top-down design, Front loading design workflow, Design in context, Modular design. Concurrent engineering: Work structuring and team deployment, Product and process systematization problem, Identification and solving methodologies. Product reliability, Mortality curve. Design for manufacturing, Design for assembly, Design for six sigma. Product modeling: Definition of concepts, Fundamental issues, Role of process chains and product models, Types of product models, Model standardization efforts, Types of process chains, Industrial demands. Types of analysis tools: Design for manufacturing: Machining, Casting and metal forming, Optimum design, Design for assembly and disassembly, Probabilistic design concepts, Failure mode and effects analysis (FMEA), Quality function deployment (QFD), Taguchi method for design of experiments, Design for product life cycle. Estimation of manufacturing costs, Reducing the component costs and assembly costs, Minimize system complexity. Product data management (PDM) technology: Product data management: An introduction to concepts, Benefits and terminology, Common information model (CIM) data. PDM functions, Definition and

architectures of PDM systems, Product data interchange, Portal integration, PDM acquisition and implementation. Recent advances: Intelligent information systems, Knowledge based product and process models, Applications of soft computing in product development process, advanced database design for integrated manufacturing. At the end of the course, the students are expected to be able to characterize product design process as an open ended structured problem solving activity, create, evaluate and select design concepts, plan prototyping and testing, apply design rules for material selection, design for manufacturability, and design for assembly.

3 Units **Design of Experiments (DOE)** **IE1104**

Introduction to experimental design principles: Simple comparative experiments. Single factor experiments: Randomized blocks, Latin square designs and extensions. Introduction to factorial designs: Two levels, 2^k factorial designs, Confounding and blocking in factorial designs, Applications to manufacturing problems. Fractional factorial designs: Two-level, three-level and mixed-level factorials and fractional factorials, Applications to quality control problems and its applications in DOE problems. Regression models: Including multiple regression models and its application to transportation scheduling problems. Response surface methodology (RSM): Parameter optimization, Robust parameter design and its application to control of processes with high variability. Random and mixed effects models: Nested and split plot and strip plot designs and its application to semiconductor manufacturing problem. Repeated measures design: Analysis of covariance and its applications in comparing alternatives. Design of computer experiments and the applications in industrial engineering problems. At the end of the course, the students are expected to be able to exposure to the step-wise process of experimental design and how to apply the process and techniques to different and complicated problems using R programming. Additionally, this course will also be useful to the students to learn advanced techniques; like response surface methodology, which will be used in the decision making process.

3 Units **Selected Topics in Production Quality Control** **IE1105**

Advanced topics of contemporary interest in Production Quality Control.

3 Units **Forecasting Models** **IE1201**

Introduction to forecasting models: Stationary series, Autocorrelation function (ACF), Partial autocorrelation function (PACF), Sample autocorrelation function (SACF), Sample partial autocorrelation function (SPACF). Autoregressive moving average (ARMA) model: ARMA(0,0), ARMA(1,0), ARMA(2,0), ARMA(0,1), ARMA(0,2), Minimum mean square error forecasts for ARMA(p, q) Models. Nonstationar time series models: Autoregressive integrated moving average models ARIMA (p, d, q), Random walk with trend model, Error forecasts for ARIMA (p, d, q) models. Multivariate time series models: Transfer function models, Vector time series models , Space modeling and Kalman filtering threshold time series, GRACH, ARCH models. Design and building statistical forecasting system: Seasonal autoregressive integrated moving average (SAIMA) models, Decomposition method, Using moving average smoothing for forecasting, Using single and double and

triple exponential smoothing for forecasting. At the end of the course, the students are expected to be able to design and build forecasting systems based on meta heuristics, Minitab, Excel, Lingo and R packages.

3 Units	Investment Decision Making	IE1202

Overview: A manufacturing business model, Finance and cost accounting, The marketing function, The production function, Management decision-making. Modeling characteristics, Risk and uncertainty in decision-making. Financial models: Financial statements, Ratio analysis, Net present value (NPV), Investment appraisal, Portfolio management, Capital budgeting using decision trees, Cash flow analysis, Investment financing: A simulation model. Investment analysis models: Deterministic, Stochastic, Combinatorial sequential and dynamic investment decision models: Risk preference attitudes, Utility theory, Portfolio theory: the Markowitz model, Portfolio analysis: The efficient frontier, Single index model (SIM), The capital asset pricing model (CAPM), Bond valuation, Duration and bond volatility, The Black Scholes option pricing model bond valuation. Marketing models: Organizing and presenting data, Correlation analysis and linear regression, Forecasting – time series and exponential smoothing, Forecasting exponential smoothing, Sales force models. Goal programming. At the end of the course, the students are expected to be able to build and analyze simple and complex financial marketing and decision making models based on Minitab, Excel, Lingo and R packages.

3 Units	Supply Chain Management (SCM)	IE1203

Introduction to SCM: Understanding the supply chain, Supply chain performance: Achieving strategic fit and scope, Supply chain drivers and metrics. Value of information: The bullwhip effect, Quantifying bullwhip effect, Locating desired products, Lead time reduction, Conflicting objectives of SCM, Integrating the supply chain. Designing supply chain network: Designing distribution networks and applications to online sales. Network design in the supply chain, Designing global supply chain networks. Planning demand and supply in a supply chain: Demand forecasting in a supply chain, Aggregate planning in a supply chain, Sales and operations planning: Planning supply and demand in a supply chain, Coordination in supply chain. Designing and planning transportation networks: Transportation in a supply chain. Planning and managing inventories in a supply chain: Managing economics of sale in a supply chain: Cycle inventory, Managing uncertainty in a supply chain: Safety inventory, Determining the optimal level of product availability. Designing and planning transportation networks: Transportation in a supply chain. Managing cross functional drivers in a supply chain: Sourcing decisions in a supply chain, Pricing and revenue management in a supply chain, Information technology in a supply chain, Sustainability and the supply chain. At the end of the course, the students are expected to be able to solve supply chain problems which are known as NP-hard problems for finding the optimal and near optimal solutions using optimization techniques.

3 Units	Inventory Models	IE1204

Introduction: Definition, Objectives of inventory control, Inventory costs, Types of inventory, Classification of inventory models. Deterministic inventory models: Economic order quantity (EOQ): Demand rate uniform; production rate infinite, Production rate non uniform; production rate infinite. Multiproduct case: Demand rate uniform; production rate finite; Shortage allowed, Demand rate uniform; production rate infinite; shortage allowed. Inventory models with probabilistic demand: Instantaneous demand; setup cost zero; stock levels discrete and lead time zero, Continuous demand; Setup cost zero; Continuous stock levels and Lead time zero, Continuous demand; zero setup cost; stock levels continuous and lead time zero. Buffer stocks: Reorder point models with probabilistic demand and specified service level. Single period (static inventory) models: Inventory models with price breaks, Purchase inventory models, Optimal policy for an entire inventory of items. The EOQ with constrains: Limitation on investment, Inventories and storage space. At the end of the course, the students are expected to be able to design and build inventory systems in the case of single and multi period based on meta heuristics, Lingo, and R packages.

3 Units	Selected Topics in Industrial Management	IE1205

Advanced topics of contemporary interest in Industrial Management.

ثانياً: مقررات قسم الهندسة الإلكترونية

3 Units	Applied Numerical Methods	EE2001

In this course, the emphasis is on the fundamental understanding of methods, developing programming skills and f
amiliarizing students with computers as engineering tools. It includes Modeling, Floating point operations and error analysis, Backwards error analysis.Condition numbers for evaluation of an expression. Methods for Solution of Nonlinear Equations such as bisection method, secant method and Newton's method with application of contraction theorem to systems of equations are also included. The last part of the course includes Computing eigenvalues and eigenvectors, Polynomials, Bernoulli polynomials and Euler-Maclaurin formula, orthogonal polynomials and Gram-Schmitd orthogonalization theorem.

3 Units	Digital Signal Processing	EE2002

Discrete- Time signal and systems - The Z- transform - The Discrete Fourier Transform - Flow graph and matrix representation of digital filters-Digital filter design techniques - Computation of the Discrete Fourier Transform - Effect of finite register length in DSP - Power Spectrum estimation.

3 Units	Modeling and Simulation	EE2003

This course introduces the students to the most widely used software packages in academia and industry for modeling and simulating dynamical systems. Students are encouraged to try building models from scratch, or take an existing model and add to their design and visualized what happens with parameters change. It includes simulation linear and nonlinear

systems, modeled in continuous time, sampled time, or a hybrid of the two with multirate systems. The students are also introduced to hierarchical molding, so they can build models using both top-down and bottom-up approaches. By the end of the course, students are required to submit a project using some simulation toolboxes available in SIMULINK package such as communication tool box, control system toolbox, frequency-domain system identification, fuzzy logic toolbox, higher-order spectral analysis or model predictive control Toolbox.

3 Units Data Communication and Computer Networks EE2004

Overview of data communication and computer networks, including network hardware and software, as well as reference models, example networks, data communication services and network standardization. The OSI and the Internet (TCP/IP) network models are discussed. The course covers each network layer in details, starting from the Physical layer to towards the Application layer, and includes an overview of network security topics. Other topics covered include encoding digital and analog signals, transmission media, and protocols. circuit, packet, message, switching techniques, internetworking devices, topologies. LANs/WANs, Ethernet, IP, TCP, UDP, and Web applications. Labs on network analysis.

3 Units Engineering Statistics and Probability EE2005

Introduction to statistical methodology emphasizing applications in engineering. Topics include descriptive statistics, regression, analysis of variance, and design of experiments. Emphasis is on probability theory and its applications, with a smaller module at the end covering basic topics in statistics (parameter estimation, hypothesis testing and regression analysis). The probability part includes events and their probability, the Total Probability and Bayes' Theorems, discrete and continuous random variables and vectors, the Bernoulli trial sequence and Poisson process models, conditional distributions, functions of random variables and vectors, statistical moments, second-moment uncertainty propagation and second-moment conditional analysis, and various probability models such as the exponential, gamma, normal, lognormal, uniform, beta and extreme-type distributions. In addition, the graduate subject has a module on system reliability, which covers both second-moment and full-distribution techniques. Throughout the subjects, emphasis is on application to engineering and everyday life problems.

3 Units Engineering Management EE2006

This course serves as an introduction to engineering management. Topics include financial principles, management of innovation, engineering project planning and control, human factors, career planning, patents, and technical strategy. The case study method of instruction in this course emphasizes student participation in class discussion.

3 Units Advanced Electronic Circuits EE2007

The objective of this course is to cover circuit design and theory and to give student the understanding of factors governing the behavior of essential electronic materials. The main topics of this course are operational amplifiers ideal and non-ideal models and

characteristics, linear and non-linear applications operational trans-conductance amplifiers (OTAs) -model, design considerations, characteristics, phase detector circuit realization, operation and applications, multistage amplifiers, feedback theory, frequency response, voltage controlled oscillators (VCOs), phase locked loop (PLL), balanced modulator and demodulator. Transducers been covered in this course such as temperature, pressure, displacement, magnetic field, speed and acceleration. Converters devices such as D/A, A/D, V/I, I/V, V/F, F/V. Sample and hold circuit and active filters design.

3 Units **Network Security** **EE2008**

An intense examination of network security defense techniques and countermeasures with defense fundamentals explained in great detail. Network defense techniques such as designing firewall systems and IDS, configuring firewalls, VPNs, Trojan port numbers, and security related RFCs. Crypto Basics: Classic Crypto, Simple Substitution Cipher, Cryptanalysis of a Simple Substitution, Definition of Secure, Double Transposition Cipher, One-Time Pad. Symmetric Key Crypto: Stream Ciphers, A5/1, RC4, Block Ciphers, Feistel Cipher, DES. Public Key Crypto: Knapsack, RSA, Repeated Squaring, Elliptic Curve Cryptography, Elliptic Curve Math, ECC Diffie-Hellman. Hash Functions: Hash Function, Non-Cryptographic Hashes, Tiger Hash, HMAC, Uses for Hash Functions. Access Control, Authentication: Authentication Methods, Passwords, Keys Versus Passwords, Choosing Passwords, Attacking Systems via Passwords, Password Verification Math of Password Cracking. Authorization: Access Control Matrix, ACLs and Capabilities, Confused Deputy, Multilevel Security Models, Bell-LaPadula, Biba's Model, Compartments, Covert Channel, Inference Control. III Protocols Simple Security Protocols, Authentication Protocols, Authentication Using Symmetric Keys, Authentication Using Public Keys, Session Keys, Perfect Forward Secrecy. Real-World Security Protocols: Introduction, SSH, SSL, SSL and the Man-in-the-Middle, SSL Connections, SSL Versus, IPSec, IPSec, IKE Phase 1: Digital Signature, IKE Phase 1: Symmetric Key, IKE Phase 1: Public Key Encryption ,IPSec Cookies IKE Phase, IKE Phase 2, IPSec and IP Datagram's, ESP and AH, Kerberos Security, WEP, WEP Authentication, WEP Encryption, WEP Non-Integrity, GSM Authentication Protocol, GSM Security Flaws, GSM Conclusions. IV Software Software Flaws and Malware, Software Flaws, Race Conditions, Malware, Brain, Morris Worm, Code Red, SQL Slamme

3 Units **Applied Industrial Process Control** **EE2009**

You will gain knowledge of digital signal processing and the application of appropriate techniques in condition monitoring and process control, taking into account factors such as advanced human machine interface and sensor technology.

3 Units **Wireless Communication** **EE2010**

Cellular concepts, frequency reuse, co channel interference, Cell splitting. Radio propagation characteristics; models for path loss, shadowing and multipath fading (delay spread, coherence bandwidth coherence time. Doppler spread). Jakes' channel model. Digital modulation for mobile radio; analysis under fading channels; diversity techniques and Rake demodulator. Introduction to spread spectrum communication. Multiple access

techniques used in mobile wireless communications: FDMA/TDMA, CDMA. The cellular concept: Frequency reuse; the basic theory of hexagonal cell layout; spectrum efficiency. FDM/TDM Cellular systems; channel allocation schemes. Handover analysis. Cellular CDMA; soft capacity. Erring capacity comparison of FDM/TDM systems and cellular CDMA. Discussion of GSM standards; signaling and call control; mobility management; location tracing. Wireless data networking; packet error modeling on fading channels, performance analysis of link and transport layer protocols over wireless channels; mobile data networking (mobile IP); wireless data in GSM, IS-95, and GPRS.

3 Units **Digital Image Processing** **EE2101**

Introduction to image processing: this includes image formation and representation, illumination, image sampling and quantization, spatial and grey-level resolution, Isopreference curves, some basic relationships between pixels, connectivity, regions, and boundaries, distance measure, arithmetic/logic image operations. Geometric Image operations: Image resizing, interpolation and decimation, affine spatial transformations (rotation), and higher-order spatial transformations. Chapter 3: Image enhancement in spatial domain: contrast enhancement via point transformations, and histogram equalization median. Image enhancement in frequency-domain: Fourier analysis and unitary image transforms: 2-D DFT, FFT & DCT, 2-D convolution and correlation, linear filtering, 2-D FIR filters, blurring, and sharpening. Image segmentation: block processing, edge detection, region-of-interest processing, and line profiles. Image processing morphology: binary mathematical morphology, grey mathematical morphology, basic concepts of set theory, union, intersection and complement, some logical operations between binary images, dilation and erosion.

3 Units **Advanced Digital System Design** **EE2102**

Philosophy of digital system design using MSI/LSI/ VLSI Review of concepts of digital design - analysis of combinational Systems using the concept of assertion levels, polarized mnemonics minimization - Variable Entered Mapping (VEM) technique ,EX-OR & $_{NE}$ XoR function minimization ,Combinational design of mixed real systems using MSIS., Fundamental concepts of sequential machines: review of the design of flip-flops and practical considerations, Approaches to sequentional analysis & design - design of counters, shift register and memories, introduction to multi-input system controller design also be included.

3 Units **Microprocessor and Embedded Systems** **EE2103**

This course contains the development of microprocessor and Microcontroller based systems, moving towards the discussion of analysis and design of embedded microprocessor systems for communication systems, process control, automotive systems power generation and video application. The course includes review to Microprocessor System Architecture, Components of the Microprocessor, Operations of the Microprocessor, Programming Model and Internal Organization, Hierarchies, Program Creation and Execution, DSP, Multiprocessing and Micro-controller and real time specification and design. It also includes software/hardware co-design and Co-operative Multitasking.

3 Units Performance Evaluation of Computer Systems EE2104

Performance measures and evaluation techniques -Measurement techniques -Experiment design and data analysis - Fundamental of queuing models - Elementary stochastic analysis -Product form queuing Network models -Basic algorithms for product -form network, Aggregation and approximate modeling-Bounds on performance -Petri Net - Based performance modeling.

3 Units Software Engineering EE2105

Structured Programming- Modularity- Functional decomposition- Date flow design- The programming language- object-quieted programming- Functional programming- Logic programming- Software tools- Testing and implementation- Software fault Tolerance- Structured walk troughs- Chief programmer teams and project Support Libran's - software management.

3 Units Advanced Operating Systems EE2106

Advanced topics in Operating Systems which includes, but not limited to, Computer System Structures, Operating System Structures, Processes CPU Scheduling, Process Synchronization, Deadlocks Memory Management, Virtual Memory, File System Interfaces, File System Implementations, I/O Systems, Secondary Storage, Network Structures, Distributed Systems.

3 Units Computer Architecture and Parallel Processing EE2107

Processor design: memory hierarchy; bus, cache, and shared memory; disk arrays, pipelining and superscalar techniques; reducing branch penalties; multivector computers parallel array processors: SIMD computers; interconnection networks; systolic arrays multiprocessors: program and network properties; scalability issues; performance evaluation; caches and consistency issues; parallel programming and compilers; scheduling algorithms Distributed-memory multi-computers: architecture; distributed shared memory; routing and network design issues; load balancing/data mapping algorithms; performance evaluation and visualization; design of parallel algorithms; scalable, multithreaded, and dataflow architectures; applications Distributed processing: distributed operating system; load balancing algorithms.

3 Units Selected Topics in Computers EE2108

Advanced topics of contemporary interest in Computers.

3 Units Random Variables and Stochastic Processes EE2201

Stochastic processes; Definition, Normal stochastic process, stationary processes; nonlinear systems, linear time-invariant systems, Spectral analysis, linear transformation of stochastic process, Matched fitter, sampling theorem for Random processes, Band-limited stochastic processes; Narrow-band noise, Poisson processes; Stochastic control models; development

of control laws by dynamic programming; separation of estimation and control; Kalman filtering; self-tuning regulators; dual controllers; decentralized control introduction: decision-making under uncertainty. State space models: state, observation and control processes. Properties of linear stochastic systems: linear Gaussian systems; asymptotic properties, Gauss-Markov processes; quadratic costs. Controlled Markov chain models: finite state systems; Markov and stationary policies; cost of Markov policy; infinite state systems.

3 Units Information Theory and Coding EE2202

General discussion on coding theory with emphasis on the algebraic theory of cyclic codes using finite field arithmetic, decoding of BCH and RS codes, finite field Fourier transform and algebraic geometry codes, convolution codes and trellis decoding algorithms. Introduction to linear codes: Parity and generator matrices, decoding rules, cosset leaders, and standard arrays. Bounds on code parameters; Singleton, sphere-packing, Gilbert-Varshamov and other bounds. Some simple codes: Hamming, Golay, Reed-Muller codes, Finite fields: Basic theory, minimal polynomials, Cyclic codes and BCH codes: Ring ideals, generator and parity check polynomials and matrices, the BCH bond.

3 Units Communication System Design EE2203

Routing and flow control in networks: time-reverse of Markov process and reversible Markov process; tree condition, truncation and circuit switching model; a network of queues in series and output processes; open and closed networks with random routing; throughput in closed networks with random routing (with application to input buffering in a crossbar packet switch); Norton's equivalent for closed networks, product form Markov network with multiple customer types and deterministic routes; routing and flow control issues, virtual circuit and datagram routing tables, ARPANET routing updates; basic graph concepts, Prim-Dijkstra and Kruskals algorithm for MWST, Bellman-Ford algorithm for shortest path problem; Dijkstra's shortest path algorithm, optimal static routing; flow deviation algorithm; matching problem, algorithm for bipartite matching, max-flow problem; maximum flow and network reliability; min-max fair allocation of network flows; regulation of bursty traffic - generalized round robin and leaky bucket regulators; dynamic routing - fluid model, dynamic programming, diffusion model.

3 Units Spread Spectrum Communication EE2204

Transmission spectrum widening, spread-spectrum characteristics, interference and jamming margin. Processing gain, direct-sequence spread-spectrum systems (DSSS). Characteristics and generation of PN sequences. Frequency hopping, slow and fast hopping systems. Chirp FM systems. Hybrid spread-spectrum, FH/DS modulation. Coding, autocorrelation and cross correlation of the codes and high-rate code generation. CDMA. RAKE receiver. Initial synchronization and acquisition, sliding correlator. Signal tracking. Tau-Dither and Delay-Lock tracking. Frequency hops synchronization. Global positioning system fundamentals.

3 Units Optical Communication Systems EE2205

Dielectric waveguides, analysis. Nonlinear fiber optics. Second order dispersion. Solitons, interactions. Coherent communications. Dispersion compensating methods, high-speed and large distance systems. Single mode, DFB and DBR semiconductor lasers, with edge and surface emitters. Erbium doped and semiconductor optical amplifiers. Semiconductor detectors. Digital and analog transmission systems, restoration digital signals. Optical fiber networks. Optical switching, integrated optical circuits.

3 Units Microwave Theory and Antenna Design EE2206

Introductory antenna theory and design. Fundamentals and definitions, simple radiating systems, arrays, line sources, wire antennas, broadband antennas, and antenna measurements, small and half-wave, as well as small loop antennas. By the end of the course, students are expected to perform the following: Design linear and planar arrays using pattern multiplication., analyze broadband antenna concepts and performance, analyze resonant, patch antennas, and line sources, analyze plane wave propagation in various media and the reflection and refraction characteristics at interfaces with boundaries and Design microwave impedance matching networks, single section and wideband multisection networks.

3 Units Data Transmission EE2207

Study of modern telecommunication and data networks; packet and circuit switched networks; ATM; congestion control; mathematical modeling of networks; economics. Finishing this course, students are expected to learn the following topics: Layering Protocol Mode, Physical Layer, Physical Media, Digital Baseband Transmission, Digital Modulation, Coding, Error Detection and Correction, Data Link, Point to Point, Multiplexing in Wireline and Wireless, Circuit Switched Networks, Frame Relay & ATM ,Local Area Networks (Wired), Wireless LAN, IP and Routing (Network Layer), Transport layer and upper applications.

3 Units Broad Band Communication Networks EE2208

covers circuit and system level design issues of high speed communication systems, with primary focus being placed on wireless and broadband data link applications. Specific circuit topics include transmission lines, high speed and low noise amplifiers, VCO's, and high speed digital circuits. Specific system topics include frequency synthesizers, clock and data recovery circuits, and GMSK transceivers. In addition to learning analysis skills for the above items, students will gain a significant amount of experience in simulating circuits in SPICE and systems in CppSim (a custom C++ simulator).

3 Units	Next Generation Networks	EE2209

In this course, students will examine the various concepts and technologies being used to achieve next generation networks goals. Issues studied will include: core routing techniques such as MPLS, IP multicast, multi-topology routing, and IPv6; traffic management and quality of service protocols; IP video on demand and video simulcast techniques and issues; last-mile access technologies such as DSL, DOSCIS, and broadband fixed and mobile wireless. The course will explore the theory of the underlying protocols algorithms and practical constraints, and trade-offs associated with technology choices and network design. The method of teaching will be through lectures by the instructor and occasional guest lectures by industry experts. Students will be asked to help prepare and participate in one lecture segment during the semester. There will be a final project and an examination. Prerequisites: Prior course in computer networks and familiarity with network protocols.

3 Units	Selected Topics in Communications	EE2210

Advanced topics of contemporary interest in Communications.

ثالثاً: مقررات قسم الهندسة الكهروميكانيكية

3 Units	Advanced Power Electronics	EM3101

Principles of power electronics devices and introduce students to different electronics devices and converters. Emphasis is on the utilization of power electronics for renewable energy systems, such as, photovoltaic solar and wind, will be given. Application of electronics to energy conversion and control; modeling, analysis and control techniques; design of power circuits including inverters, rectifiers, and dc-dc converters; analysis and design of magnetic components and filters; characteristics of power semiconductor devices; and numerous application examples, such as motion control systems, power supplies and photovoltaic solar power system.

3 Units	Advanced Power System Analysis	EM3102

Formation of Z bus of a transmission line, power flow studies by various methods. Power system optimization: Objective functions, constrains and methods of solutions. Power system security: Definition of system security, types of system security, steady state security, contingency analysis. Electric Load Forecasting: load Behavior, load Curve characteristics, weather and electric load, load growth behavior, trending methods for load forecasting.

3 Units	Analysis of Electrical Machines	EM3103

Basic concepts of electromechanical energy conversion systems. Energy balance. Principles of the generalized theory of electrical machines. The primitive machine. The

two axes reference frame. Generalized analysis of commutator dc and cross-field machines. Theory of linear transformation. Generalized analysis of induction machines.

3 Units High Voltage and Insulation Systems EM3104

Introduction to high voltage concept. Properties of different insulation systems on high voltage based on: gas, solids and liquid/paper. Mechanisms of electrical conduction, polarization, dielectric loss and breakdown. Electrical discharges (PDs) in gases: types of discharges, partial discharges, PD behavior and its shape, Importance of PD detection. Partial discharges detection techniques: Acoustic, electrical, chemical, light emission, etc. Effect of PDs on surfaces of electrodes. Sulphur Hexafluoride: Manufacturing of SF6, physical and chemical properties, attachment and detachment, behavior of gases dielectric in an electric field, dielectric strength, Arc quenching properties, importance of SF6, Gas-Insulated Systems. Performance of contaminated insulators: classification of site pollution, conductivity measurement of contamination, artificial pollution test insulator. Insulation Integrity and safety.

3 Units Advanced Control System EM3201

Control systems design by the root-locus method. Control systems design by frequency response. PID controls and Introduction to Robust control. State-space modeling and analysis of control systems: state vector differential equations, transition matrix, characteristic equation, eigenvalues and eigenvectors, similarity transformation and canonical forms, solution of the state equations. Theory of scalar and multivariable realization: state space realizations of transfer function matrices, non-minimal realizations, minimal realizations. Cayley-Hamilton theorem. Controllability and Observability of linear systems. Design of control systems in state space: Pole Placement, design of regulator-type systems by pole placement, design of full-order and reduced-order state observer design, design of Servo system. Liapunov stability analysis of linear time invariant systems. Quadratic Optimal Control and model-reference control systems.

3 Units System Identification and Estimation EM3202

System Identification: Single processing. Non-Parametric: Frequency response analysis, correlation analysis. Parametric: Constructing parametric models, Least squares estimation, Instrumental likelihood estimation, model structure selection, Model validation. State Estimation: State reconstruction (Observers), Minimum mean square error estimation, Recursive state estimation, The general Kalman filter/predictor, Steady state KF; CARMA estimation problem, Kalman filter – some estimations.

3 Units Optimal Control EM3203

Introduction. The linear optimal regulator problem. The principle of optimality. The Hamilton-Jacobi equation. The matrix Riccati equation. Solution of the Riccati equation. The Infinite-Time regulator problem. Properties of the optimal regulator. The Euler-Lagrange equations. State estimate feedback. Loss of robustness and loop transfer recovery. Optimal pole region assignment and linear matrix inequalities.

3 Units Control and Operation of Electric Power System EM3001

Unit commitment and application of dynamic programming, fuel budgeting and planning, probabilistic production cost modeling, hydrothermal coordination, power system security and application of expert systems, state estimation, optimal power flow, interchange evaluation and power pools, reactive power planning.

3 Units Renewable Power Generation EM3002

Wind energy conversion systems, and micro grids with hybrid power sources. Modeling and control of renewable energy sources such as wind turbine generation, solar panel, fuel cell and power electronics interfaces, Integration of renewable energy systems.

3 Units Protection Devices and Systems EM3003

Digital Computer Control Design Methods: Discrete system stability, continuous design with discrete equivalents, design in the z-domain, frequency domain, deadbeat control, pole placement. Digital Controller Implementation Issues: Digital filter structures, PID implementation, effect of coefficient and signal quantization. Uses of microcontroller with embedded system are studied.

3 Units Power Systems Operation and Economics EM3004

Introduction to optimization and optimal economic system operation: i) Introduction to power system economics: electricity as a commodity and trade-off between economical and secure supply. ii) Introduction to nonlinear optimization concepts and Karush-Kuhn-Tucker (KKT) conditions . iii) Introduction to economic dispatch, KKT solution, and interpretation of Lagrange multipliers. iv) Introduction to unit commitment . Electricity markets and power system economics. Concepts of power system security: i) Supply and demand balance over different timeframes, ancillary services in a market environment and concept of (N-x) security. ii) Optimal power flow and DC approximation. Power system investment: i) Generation investment: Drivers for capacity expansion and retirement; risks. ii) Transmission investment: Costing and pricing of transmission networks; value of transmission; need for regulation; approaches to transmission pricing.

3 Units Power System Reliability EM3005

The concept of reliability, reliability indices, component reliability, generation capacity reserve evaluation, transmission system reliability, bulk power system reliability, distributed system reliability, and reliability modeling in context.

3 Units Power System Planning EM3006

Model development. Interchange capability, interconnections, pooling. Economic generator size and site selection. Concept of reserves, transformers, relays and circuit breakers. Reactive planning AC and DC systems are explored thoroughly from a planning standpoint.

3 Units Electrical Energy Distribution EM3007

This unit is designed to provide an overview of the planning and operation of urban and rural electrical distribution systems. It considers such matters as load estimation, the determination of plant ratings and the factors that influence the choice of voltage and system design. Quality of supply issues relating to harmonics and harmonic distortion will be discussed in relation to the relevant standards. Distribution system calculations will be explored in some depth and illustrated by practical examples.

3 Units Electrical Machines and Drives EM3008

Conventional Control Of Induction Motors: Review of Induction Machine operation – Equivalent circuit – Performance of the machine with variable voltage, rotor resistance variation, pole changing and cascaded induction machines, slip power recovery – Static Kramer Drive. VSI And CSI Fed Induction Motor Control: AC voltage controller fed induction machine operation – Energy conservation issues – V/f operation theory – requirement for slip and stator voltage compensation. CSI fed induction machine – Operation and characteristics. Field Oriented Control: Field oriented control of induction machines – Theory – DC drive analogy – Direct and Indirect methods – Flux vector estimation. Direct Torque Control: Direct torque control of Induction Machines – Torque expression with stator and rotor fluxes, DTC control strategy. Synchronous Motor Control: Brush and Brushless excitation – Load commutated inverter fed drive.

3 Units Multivariable Control System Design EM3009

linear system models. Controllability, observability and standard forms. Poles and Zeros of multivariable systems. Frequency-Domain design techniques: Control objectives, Design specification, Multivariable system representation, Functional controllability, Normalization. Robust control.

3 Units Adaptive Control EM3010

System models for self tuning. On-Line estimation of parameters. Extended least squares. Maximum likelihood, stochastic. Gradient algorithms. Controller design by pole assignment. Self tuning property. Extremum control. Self tuning prediction. Minimum variance control. Implicit self tuning. The GMV algorithm. Multistage controllers.

3 Units Electric Power System Quality EM3011

This course will provide the background and the developed standard definitions for the different types of power quality phenomena. Describing the four major classes of power quality variations in details: sags and interruptions, transients, harmonics, and long-duration voltage variations. Provides an overview of key wiring and grounding problems that occur within customer facilities and some general guidelines on identifying and correcting them. Custom power devices, such as, active power filters, for power quality enhancement at distribution level.

3 Units	Nonlinear Control	EM30112

Phase-plane methods: Classification of singular points, Approximate construction of trajectories. Lyapunov functions: Methods of construction and use. Piecewise-linear systems: Methods of broken-line approximation. Tsypkin's method for relay systems. Harmonic linearization: Calculation of typical describing functions, use in predicting oscillations. Stability analysis of fuzzy logic control systems. Deliberately non-linear controllers. Sliding mode control. Bang-bang control. Absolute stability: Circle and Popov criteria, small gain theorem applied to robust control.

3 Units	Selected Topics in Power Systems	EM30113

Selected Topics in Power Systems.

3 Units	Selected Topics in Control	EM30114

Advanced topics of contemporary interest in Control.

الجدول رقم (1)

كشف بأسماء الطلبة الخريجين تخصص الهندسة الصناعية

م.	الاســـــم	الشعبة	تاريخ التخرج
.1	سليمان محمد سليمان قليوان	الإنتاج وضبط الجودة	ربيع 2000/2001
.2	مصطفى أحمد منصور شكشك	الإدارة الهندسية	ربيع 2001/2002
.3	إبراهيم أحمد بشير بادي	الإنتاج وضبط الجودة	ربيع 2001/2002
.4	علي أحمد منصور شكشك	الإدارة الهندسية	ربيع 2001/2002
.5	علي قاسم محمد شتوان	الإنتاج وضبط الجودة	خريف1999/2000
.6	منصور سالم عمر زغينين	الإدارة الهندسية	خريف1999/2000
.7	منصور عاشور خليفة الشريف	الإدارة الهندسية	خريف2007/2008
.8	عمر إبراهيم سالم اعزوزة	الإدارة الهندسية	خريف1999/2000
.9	سالم أحمد محمد الفقي	الإنتاج وضبط الجودة	خريف2001/2002
.10	عمر علي علي شنب	الإنتاج وضبط الجودة	ربيع 2000/2001
.11	عبدالله البشير أحمد بادي	الإنتاج وضبط الجودة	خريف2003/2004
.12	مسعود عمر مسعود مزيد	الإنتاج وضبط الجودة	خريف2002/2003
.13	خالد عمران عامر العكروتي	الإدارة الهندسية	ربيع 1998/1999
.14	إبراهيم سالم محمد النيحوي	الإدارة الهندسية	ربيع 2000/2001
.15	علي ابراهيم محمد الفقيه	الإدارة الهندسية	ربيع 2000/2001
.16	محمد علي ميلاد الدرويش	الإدارة الهندسية	ربيع 1998/1999
.17	عوض إبراهيم محمد زبلح	الإنتاج وضبط الجودة	ربيع 1998/1999
.18	بشير مختار أحمد بن زعبية	الإدارة الهندسية	ربيع 2001/2002
.19	يوسف خليفة أحمد حويل	الإدارة الهندسية	ربيع 2005/2006
.20	فتحي المهدي عمر التريكي	الإدارة الهندسية	ربيع 2006/2007
.21	علي أحمد علي بوميس	الإدارة الهندسية	خريف2008/2009
.22	محمود محمد محمد الجعلي	الإدارة الهندسية	خريف1999/2000
.23	مصباح خريص مفتاح معاتقي	الإنتاج وضبط الجودة	ربيع 2001/2002
.24	محمد نجيب الطيب طرينه	الإدارة الهندسية	ربيع2006/2007
.25	جبريل محمد القذافي عيسى	الإدارة الهندسية	ربيع 2000/2001
.26	محمد علي مصطفى شتوان	الإدارة الهندسية	ربيع 2000/2001
.27	جلال عبدالسيد علي سرار	الإنتاج وضبط الجودة	ربيع 2000/2001
.28	عبدالله سالم جمعة المشرقي	الإدارة الهندسية	خريف2004/2005
.29	محمد سعد صالح سلامة	الإدارة الهندسية	ربيع 2000/2001
.30	عوض علي عوض الدوريش	الإدارة الهندسية	ربيع 2004/2005
.31	فيصل سالم عاشور عمران	الإدارة الهندسية	خريف2005/2006
.32	حسين مخلوف علي كرزاب	الإنتاج وضبط الجودة	خريف2005/2006
.33	سالم عبدالسلام محمد التركي	الإنتاج وضبط الجودة	خريف2005/2006
.34	محمد مفتاح رجب الخمري	الإنتاج وضبط الجودة	خريف2006/2007
.35	عبدالعظيم سالم أحمد باله	الإنتاج وضبط الجودة	خريف2003/2004
.36	جمال محمد أحمد بن ساسي	الإدارة الهندسية	خريف2003/2004

الجدول رقم (2)

كشف بأسماء الطلبة الخريجين تخصص الهندسة الإلكترونية

م.	الاســـــم	الشعبة	تاريخ التخرج
.1	أسماء عبدالله مصطفى المنقوش	الحاسوب	ربيع 2006/2007
.2	أحمد عبدالقادر أحمد جحا	الحاسوب	ربيع 2007/2008
.3	إبراهيم مصطفى الهمالي أبوطلاق	الاتصالات	ربيع 2009/2010
.4	سالم عمر محمد ساطي	الحاسوب	خريف2007/2008
.5	عمر علي غيث أبوعلة	الاتصالات	ربيع 2006/2007
.6	فاطمة على صالح المحجوب	الحاسوب	خريف2014/2015
.7	هدى بدر الدين عمر أبوغرسة	الحاسوب	ربيع 2007/2008
.8	وسام محمد عمر الترجمان	الحاسوب	خريف2007/2008
.9	شيرين حمدتو محمد صلاح	التحكم	ربيع 2011/2012
.10	ديما عبدالحفيظ محمد المصطفى	الحاسوب	ربيع 2007/2008
.11	مصباح عقيل ميلاد شرف	الحاسوب	ربيع 2008/2009

الجدول رقم (3)

كشف بأسماء الطلبة الخريجين ببرنامج الدراسات العليا

في البرنامج المشترك مع الجامعات البريطانية

م.	الاســـــم	الشعبة	تاريخ التخرج
.1	عائشة رمضان محمد هجرس	الحاسوب	خريف2011/2012
.2	فيصل عبدالرحمن خليل الفقيه	الاتصالات	خريف2011/2012
.3	محمد رجب محمد معافه	الاتصالات	خريف2011/2012
.4	عبدالعزيز محمود سليمان سويب	الحاسوب	خريف2011/2012
.5	بشير ميلاد محمد الخراز	الحاسوب	خريف2011/2012
.6	محمد الهادي حسين الجمل	الحاسوب	خريف2011/2012
.7	أيمن السنوسي محمد أبوفناس	الحاسوب	خريف2011/2012
.8	منير رمضان خليفة فكرون	الاتصالات	خريف2011/2012
.9	فرج محمد امحمد الأجنف	الاتصالات	خريف2011/2012
.10	وائل محمد سالم قرمة	الاتصالات	خريف2011/2012
.11	ربيع خليل محمد العالم	الحاسوب	ربيع 2010/2011
.12	خالد امحمد محمد حيدر	الاتصالات	ربيع 2010/2011
.13	عفيف صالح امحمد أبوغرسة	الاتصالات	خريف2011/2012
.14	علي الصديق علي جويد	الاتصالات	ربيع 2010/2011
.15	مصطفى حسين الصديق الزواوي	الاتصالات	ربيع 2013/2014
.16	سالمة علي أبوبكر التايب	الاتصالات	ربيع 2010/2011
.17	عبدالله محمد عبدالله بلابلة	الاتصالات	ربيع 2012/2013
.18	صلاح الدين أحمد عمر دبك	الحاسوب	ربيع 2011/2012
.19	عبدالرحمن أبوبكر امحمد الحطبة	الاتصالات	خريف2011/2012
.20	فيصل التهامي علي الزعيليك	الاتصالات	ربيع 2010/2011
.21	عبدالمجيد محمد محمد عياد	الحاسوب	ربيع 2011/2012
.22	التهامي مفتاح التهامي الغول	الاتصالات	خريف2011/2012
.23	طارق أبوبكر أحمد أبوليفة	الحاسوب	ربيع2011/2012
.24	أسامة محمد حسين الرجوبي	الحاسوب	ربيع 2010/2011
.25	عمر بدر الدين أبوغرسة	الاتصالات	ربيع2011/2012
.26	عمر امحمد عبدالمجيد الرملي	الاتصالات	ربيع 2010/2011
.27	محمد على خليل بادي	الاتصالات	ربيع2012/2013
.28	نزار محمد مصطفى باكير	الاتصالات	ربيع 2013/2014
.29	أحمد عبد الرحمن أحمد بادي	الاتصالات	ربيع 2013/2014
.30	مهند مصطفى سعد اشرير	الاتصالات	خريف2015/2014