



وزارة التعليم العالي
المعهد العالي للهندسة و تكنولوجيا السيارات و الطاقة بهيليوبليس الجديد



دليل الطالب

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

كلمة السيد رئيس مجلس إدارة المعهد

يسعدني أن أرحب بكم في رحاب المعهد العالي للهندسة وتكنولوجيا الطاقة - بهليوبوليس الجديدة، هذه المؤسسة العلمية العريقة التي وضعت نُصب عينيها منذ اليوم الأول لتأسيسها، بناء شخصية الطالب وتزويده بالمعارف والمهارات ، وتدعيم خبراته وإطلاق قدراته وطاقاته، وتعزيز روح البحث والريادة والإبداع لديه، مع الالتزام بقواعد الخلق القويم والقيم الوطنية الأصيلة ، ليكون عنصر فاعل ومؤثر في المجتمع. ويسعى المعهد العالي للهندسة وتكنولوجيا الطاقة - بهليوبوليس الجديدة، إلى أن يؤسس مكانة رفيعة محليا واقليميا ودوليا. وانطلاقا من ذلك يحرص المعهد العالي للهندسة وتكنولوجيا الطاقة - بهليوبوليس الجديدة، على أن يتواصل مع الجامعات العريقة العربية ، والأجنبية، لأن أهداف التنمية لا تتجه إلى الطلبة فحسب بل تتجاوزهم إلى القائمين على التعليم ، فتيسر لهم أسباب التزود بالمعرفة للارتقاء بالأداء من خلال التنمية البشرية والفكرية وتحفيز الإبداع في مجتمع تعليمي متكامل من النواحي العلمية والأكاديمية والثقافية والفنية والرياضية ، لتكون بوتقة تتلاقى فيها الأفكار وتنمى فيها المواهب وروح العمل الجماعي. ويحرص المعهد العالي للهندسة وتكنولوجيا الطاقة - بهليوبوليس الجديدة، على تحقيق مخرجات تعليمية متسقة مع احتياجات سوق العمل ، الذي يتطلب درجة عالية من التميز والتنافس والإبداع، وذلك في اطار السعى إلى تحقيق الجودة في منظومة التعليم والتعلم والبحث العلمي وخدمة المجتمع بما يمكنها من المنافسة إقليمياً ودولياً والمساهمة في تنمية اقتصاد المعرفة والإبداع بما يعود على المجتمع المصرى بالتقدم والرخاء. وفي الختام أتقدم بخالص الشكر والتقدير لجميع منسوبي المعهد العالي للهندسة وتكنولوجيا الطاقة - بهليوبوليس الجديدة، على كافة المستويات لجهودهم المتواصلة بما يسهم في وصول المعهد العالي للهندسة وتكنولوجيا الطاقة - بهليوبوليس الجديدة، لمصاف المؤسسات التعليمية العالمية ، ورقى وطننا الحبيب مصر.

والله ولى التوفيق،،،

د. يسري الهلالي

الفصل الأول

مقدمة

الأكاديمية فى سطور

NHE ACADEMY

تعتبر من أولى الأكاديميات في مصر التي تقدم برامج متميزة في هندسة الاتصالات وهندسة السيارات وكذلك هندسة الطاقة الجديدة و المتجددة كتخصصات فريدة يحتاجها سوق العمل المصري والعالمي. عوامل عدة ساهمت في التزايد السريع للطلب على المتخصصين في مجال هندسة السيارات وهندسة الاتصالات وهندسة الطاقة الجديدة والمتجددة منها ؛ التطور العالمي في تكنولوجيا صناعة السيارات بسبب توجه الدولة لتوطين تلك الصناعة الحيوية في مصر والتطور السريع محليا وعالميا في هندسة الاتصالات والذكاء الاصطناعي بجانب الاهتمام الدولي بمجال الطاقة وهندسة الطاقة الجديدة والمتجددة.

مميزات NHE ACADEMY الفريد من نوعه في مصر

- الشهادة الممنوحة تكون معادله لشهادة كليات الهندسة في مصر.
- تنظم الأكاديمية تدريب ميدانية بالتعاون مع المصانع و الشركات الرائدة بمجالات الهندسة المختلفة لتأهيلك لسوق العمل مباشرة.
- تخصصات نادرة تتيح لك فرصة أفضل بسوق العمل.
- تمنح الأكاديمية بكالوريوس الهندسة معتمد من المجلس الأعلى للجامعات و مدة الدراسة خمس سنوات.
- التسجيل في نقابة المهندسين بعد التخرج من المعهد.
- التسجيل بجمعية المهندسين العرب بعد التخرج من المعهد (شرط أساسي للعمل ببعض الدول العربية).
- تؤهلك للالتحاق بالدراسات العليا في جميع الجامعات المصرية.



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- تدريب عملي في كبرى الشركات و الهيئات مثل (الهيئة العربية للتصنيع – هيئة الطاقة الجديدة و المتجددة – شركة هواوي العالمية – شركة هيونداي و بيجو).
- فرص عمل للخريجين.
- يقبل المعهد الحاصلين على شهادات:-.
- 1. الثانويه العامه شعبة رياضيات و ما يعادلها من الشهادات العربيه و الأجنبيه.
- 2. -الثانويه الأزهرية
- 3. -الثانوية الصناعيه نظام 3 سنوات و دبلوم المعاهد الفنيه الصناعيه و المدارس الفنيه الصناعيه نظام 5 سنوات و ما يعادلها.
- يوجد وسائل نقل.
- يوجد سكن للمغتربين و إمكانية توفير وجبات.

يمنح المعهد العالي للهندسة و التكنولوجيا السيارات و الطاقة بهيليوبليس الجديدة البكالوريوس فى:

1. هندسة الطاقة الجديدة و المتجددة.
2. هندسة السيارات.
3. هندسة الإتصالات.

رؤية NHE أكاديمي

التميز والريادة محليا وإقليميا وعالميا.

رسالة NHE أكاديمي

تقدم NHE أكاديمي تعليم هندسي وتكنولوجي متميز وتساهم في تقدم البحث العلمي بهدف خدمة المجتمع وتنمية البيئة من خلال تخصصاتها المتفردة من خلال إعداد مهندسين متميزين قادرين على المنافسة محليا وإقليميا ودوليا في النواحي العلمية والبحثية والأخلاقية وحل مشكلات المجتمع وتنمية موارده في إطار الالتزام بالقواعد المنظمة للمجتمع.

أهداف NHE أكاديمي

- في إطار الغايات الإستراتيجية الأربع التي حددتها الأكاديمية لنفسها ، فقد تم صياغة مجموعة من الأهداف الاستراتيجية التي يسعى كافة من ينتسبون ل NHE أكاديمي إلى تحقيقها وتتمثل فيما يلي:
- تدعيم وتحسين القدرة المؤسسية بأن يكون للعنصر البشري على إختلاف أدواره قيمة في منظومة متكاملة لجودة الخدمات المهنية الهندسية في NHE أكاديمي.
 - تطوير المعايير الأكاديمية للبرامج التعليمية لتدريس العلوم الهندسية على النحو الذي يتناسب مع طبيعة المجتمع المصري ويحقق متطلبات المعايير القومية للجودة لتتواءم NHE أكاديمي مكانة قيادية رفيعة المستوى في مجال تدريس العلوم الهندسية والتكنولوجية.
 - تحسين وتطوير نظم التعليم والتعلم بخلق وصيانة بيئة تعليمية تحقق الإبداع ، والرفع من جودة وكفاءة عملية التعليم والتعلم.
 - رفع كفاءة البحث العلمي وتنمية موارده ، لتكون استراتيجية البحث العلمي مستجيبة لاحتياجات المجتمع ، ومحقة لأرقى مستويات ومعايير البحث الأكاديمي العالمية ، وملتزمة أشد الالتزام بالقيم الأخلاقية للبحث العلمي وفقا لهوية مجتمعنا الثقافية.
 - تعزيز المشاركة المجتمعية وتنمية البيئة وتنمية الموارد الذاتية للأكاديمية بإستقرار دائم لاحتياجات المجتمع وتحقيق الكفاءة في استخدام الموارد لتعظيم العائد للخدمات الاستشارية وتطوير الخدمات الحياتية.
 - وضع منظومة التقويم المستمر من أجل التعلم وإدارة الجودة بما يحقق أهداف الأكاديمية وذلك من خلال المراجعة المنتظمة والتقييم المستمر لهذه البرامج والأنشطة.

تدعم NHE أكاديمي كل ما يتعلق بالتدريب الميداني للطلاب والخريجين وذلك من خلال:

- توفير شراكة مع شركات عالمية لتدريب الطلاب بها واكتساب الخبرات مثل:
 - هيئة الطاقة الجديدة و المتجددة
 - مصانع الهيئه العربيه للتصنيع
 - مصنع قادر للسيارات التابع للقوات المسلحه
 - الشركه العربيه الأمريكيه للسيارات AAV
 - مصنع ميني باص شيفروليه خلف باص
 - توكيل هيونداي
 - توكيل بيجو
- شركة هواوي لتكنولوجيا الاتصالات و غيرها من الشركات والمؤسسات الرائدة والعالمية في مجالات الهندسة
- توفير معامل وورش فنية للتدريب أثناء فترات الدراسة.
- توفير مدربين ومدربات متخصصين في جميع الاقسام الهندسية المختلفة.
- متابعة الطلاب اثناء فترة التدريب وحل جميع مشاكلهم

إختصاصات قسم شئون التعليم والطلاب

يختص قسم شئون التعليم والطلاب بالمهام التالية:-

- المشاركة فى رسم السياسة الخاصة بشئون الدراسة والامتحانات والتعليم والطلاب.
- متابعة تنفيذ قرارات المجلس الأعلى للجامعات ومجلس الأكاديمية ومجلس شئون التعليم والطلاب.
- الاشتراك فى تحديد المواعيد الخاصة ببدء العام الدراسى وانتهائه والأجازة الصيفية فى ضوء قرارات المجلس الأعلى للجامعات وإبلاغها للأكاديمية.
- إعداد الإحصائيات والبيانات المطلوبة لاستخراج المعلومات وإعداد التقارير الدورية والسنوية بالإضافة إلى إعداد الجداول اللازمة للتدريس وتحديد الساعات اللازمة لها.
- استقبال الطلاب الجدد وتوزيعهم على البرامج المختلفة وفقاً للمعايير التى يقرها مجلس الأكاديمية.
- إعداد ملف خاص لكل طالب ، بإدخال البيانات الخاصة بالطلاب على قاعدة البيانات بالأكاديمية وتقييدها بالسجلات.
- استخراج كارتنيحات الطلاب بعد سدادهم الرسوم الدراسية المقررة.
- إعداد قوائم الطلاب وإرسالها للأقسام العلمية المختلفة ومتابعة مواظبة الطلاب على حضور المحاضرات والسكاشن.
- المشاركة فى أعمال التدريب الصيفى لطلاب الأكاديمية.
- إعداد البطاقات اللازمة للكنترول والملاحظة والمراقبة وأعمال الامتحانات.
- تقييد وتجميع النتائج الخاصة بالامتحانات وتسجيلها بالسجلات.
- تحرير استمارات الكشف الطبى للطلاب الجدد وإعداد بطاقات التأمين الصحى.
- تحويلات الطلاب من وإلى الأكاديمية ونقل ووقف القيد.
- استخراج شهادات القيد.
- متابعة أداء التربية العسكرية للطلاب الذكور.
- مراجعة استمارات التصحيح الخاصة بالسادة أعضاء هيئة التدريس وكذلك المنتدبين.

الأنشطة

أنشطة الجواله والخدمة العامة:-

أنشطة الجواله والخدمة العامة من الأنشطة المميزة، حيث تشجع NHE أكاديمي الطلاب فرادى أو جماعات على التقدم بخطة للنشاط اليدوي من خلال إدارة رعاية الطلاب ، ويهدف هذا النشاط إلى غرس مبادئ إنكار الذات والاعتماد على النفس وبذل الجهد والعطاء والتضحية في سبيل الآخرين. ويركز هذا النشاط على تنمية المهارات اليدوية والأنشطة الخارجية ، مثل: المعسكرات الكشفية والتشجير والدهان والصناعات الخشبية. وهو نشاط ينمي قدرات الطالب العملية ويوازن بينها وبين الأنشطة الفكرية.

الانشطة الفنية والأدبية:-

تهدف الانشطة الفنية والأدبية إلى تنمية الهوايات وإبراز مواهب الطلاب الفنية ، من غناء فردي وجماعي، وعزف فردي وجماعي، وتمثيل مسرحي وفنون تشكيلية. وتدعم NHE أكاديمي هذا النشاط من خلال ميزانية خاصة ، وتظهر نتائجه في احتفالات الأكاديمية السنوية ومناسباتها الموسمية المتعددة. وقد تم تخصيص وتجهيز غرفة خاصة للموسيقى، يتدرب فيها أعضاء فرقة الموسيقى بالأكاديمية بصورة منتظمة.

النشاط الثقافي:-

يتيح النشاط الثقافي فرصًا عديدة للطلاب للتعبير الحر عن آرائهم في قضايا المجتمع والمشاركة في حل المشكلات التي تواجههم، وكذلك إتاحة الفرصة للطلاب المبدعين في مجالات الأدب المختلفة ؛ لإظهار مواهبهم في الشعر والكتابة القصصية وغيرها من فنون الأدب الأخرى ، كما تم توفير غرفة للموسيقى مجهزة بالآلات الموسيقية ؛ لتمكين الطلاب من ممارسة النشاط الفني.

الندوات والمسابقات الطلابية:-

تتطلع الأكاديمية إلى تنظيم فعاليات لنادي الكتاب الذي يعقد ندوات منتظمة ؛ لمناقشة الكتب التي تم قراءتها بواسطة الأعضاء، سعيًا من NHE أكاديمي لعقد مسابقات طلابية سنوية منتظمة في الثقافة والمعلومات العامة.



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النشاط الرياضي والرحلات:-

يتم تخطيط هذه الأنشطة وتنفيذها تحت إشراف اتحاد طلاب NHE أكاديمي ، وتهدف أيضًا إلى تنمية الروابط الاجتماعية بين الطلاب وبينهم وبين أعضاء هيئة التدريس والعاملين والمجتمع الخارجي، وبث الروح الجماعية وروح التعاون والإخاء بينهم. وتضم هذه الأنشطة الرحلات والمعسكرات والأنشطة الجماعية والحفلات والمسابقات الترفيهية. كما تشمل العديد من المسابقات مثل: الشطرنج – مسابقة الطالب المثالي والطالبة المثالية – الزيارات الميدانية، وغيرهم العديد.



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الفصل الثانى

نظام الدراسة بالمعهد

نظام الفصلين الدراسيين

- مدة الدراسة بالأكاديمية خمس سنوات وتنقسم الى السنة الاعدادية يليها أربع سنوات تخصصية ينال بعدها الطالب درجة البكالوريوس فى الهندسة.
- السنة الدراسية بها فصلين دراسيين ومدة كل فصل 15 أسبوعا.

لتوزيع الطلاب على أقسام الأكاديمية وضعت القواعد التالية:

- يحرر الطالب بالفرقة الإعدادية استمارة تسجيل رغباته للانضمام لأحد الأقسام العلمية مع عدم تكرار أى قسم منها.
- يوزع الطلاب على أقسام الأكاديمية المختلفة وفقا للأعداد التى يقترحها مجلس المعهد بعد أخذ رأى الأقسام العملية.
- يحق للطلاب التحويل من قسم إلى آخر خلال الأسبوع الأول من بدء الدراسة بالأكاديمية على أن لا يقل مجموعه عن الحد الأدنى للقسم الذى يرغب فى التحويل إليه.
- لا تقبل الأكاديمية أى استثناءات أو أعذار مرضية للتحويل بين الأقسام العلمية.



الفصل الثالث

تعريفات Definitions

BAS	Mathematics and Basic Science
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AUT	Mathematics	BAS x2x
	Physics	BAS x3x
	Chemistry	BAS x4x
	Humanities and Social Science Courses	HUM x5x
	Business administration	BAS x6x
	Engineering culture	BAS x7x
	Business Administration	BAS x8x

Basic Engineering Science Courses	AUT x1x
Application and Design Courses	AUT x2x

ENG	New and Renewable Energy Engineering Department
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Application and Design Courses	REG x1x
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COM	Communication Engineering Department
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Basic Engineering Science Courses	COM x1x
Application and Design Courses	COM x2x
Computer Courses	COM x3x

Note:

- 1- The first digit after the symbol represents the level (0 preparatory year – 1 first year – 2 second year - 3 third year – 4 forth year).
- 2- The second digit after the symbol represents the type of course (Basic Engineering Science Courses - Application and Design Courses).
- 3- The third digit after the symbol represents the course number.



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الفصل الرابع

مقررات البرامج الهندسية بالمعهد

Automotive Engineering

Automotive Engineering Program Specifications



Automotive Engineering Program Specifications

1- Program Educational Objectives

A. Department Mission Statement

The Department's mission is to provide all students with opportunities to address complex and multi-faceted automotive engineering problems. The Department provides students with the fundamentals necessary to evolve in the profession and to respond to changing technological and societal needs. In addition, the Department's program provides the depth of preparation and fosters intellectual curiosity needed for graduate studies and research.

B. Program Educational Objectives

Following graduation, our students are expected to:

- 1) Successfully apply fundamental mathematical, scientific, and engineering principles in formulating and solving engineering problems;
- 2) Work competently in automotive engineering areas of practice;
- 3) Work effectively and conduct themselves ethically in their professional environment; and
- 4) Develop improved skills and new skills to enhance the state of their practice in a dynamic professional environment.

C. Student Outcomes

We have adopted the National Academic Reference Standards (NARS) as our own Program Outcomes. In order to develop improved skills and new skills to enhance the state of their practice in Automotive Engineering, students must be able to: apply knowledge of mathematics, science, and engineering; understand the impact of engineering solutions in a global, economic, environmental, and societal context; have knowledge of contemporary issues; recognize the need for, and be able to engage in life-long learning; use the techniques, skills, and modern engineering tools necessary for engineering practice; and explain basic concepts in management, business, public policy, and leadership.

It is also expected that students will need to spend additional time practicing skills in a work environment and in completing projects and assignments, in order to fulfil Training Package assessment requirements. Work placement is a mandatory requirement within this Framework and appropriate hours have been assigned to each course.

(1) Learning in the workplace will enable students to:

- progress towards the achievement of industry competencies
- develop appropriate attitudes towards work
- learn a range of behaviors appropriate to the industry
- practice skills acquired in the classroom or workshop
- develop additional skills and knowledge



(2)The graduates of automotive engineering programs should be able to:(NARS 2009)

- 1- Apply knowledge of mathematics, science and engineering concepts to the solution of engineering problems.
- 2- Design a system; component and process to meet the required needs within realistic constraints.
- 3- Design and conduct experiments as well as analyze and interpret data.
- 4- Identify, formulate and solve fundamental engineering problems.
- 5- Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.
- 6- Work effectively within multi-disciplinary teams.
- 7- Communicate effectively.
- 8- Consider the impacts of engineering solutions on society & environment.
- 9- Demonstrate knowledge of contemporary engineering issues.
- 10- Display professional and ethical responsibilities; and contextual understanding
- 11- Engage in self- and life- long learning
- 12- Have advanced and internationally recognized skills and in-depth technical competence necessary for a successful career in Automotive Engineering.
- 13- Are familiar with current best practice in the automotive engineering.
- 14- Are capable to work as a mechanical engineer in general, and as a manufacturing or design engineer in the areas of automotive engineering.
- 15- Possess the necessary skills to analyze and investigate the mechanical and electrical systems applied in automotive engineering.
- 16- Have the skills to work as a production line or service engineer in the automotive

2. Curriculum Description

The curricular structure is aimed to be consistent with the PEOs as follows:

- i. It provides ample opportunities in each of the nominal five years of study to ensure students can successfully apply fundamental mathematical, scientific, and engineering principles in formulating and solving engineering problems.
- ii. It ensures that graduates will be prepared to work competently in multiple core areas of automotive engineering practice.
- iii. The multiple opportunities for group work culminating in the capstone design sequence lays the groundwork for graduates to work effectively and conduct themselves ethically in the professional environment.
- iv. The balance of fundamentals and practice in the curriculum ensures graduates will be capable of furthering their education both formally and informally, and the general experience of being instructed by research-active faculty can implicitly inculcate graduates with the understanding of ongoing development and mastery of new knowledge.



3. Graduation Requirements

In order to achieve a Bachelor Degree in Automotive Engineering, a student must fulfill the following NARS requirements:

List of these Courses are as follows

Humanities and Social Sciences	8.3 %
Basic Science Courses	19,66 %
Basic Engineering Science Courses	30 %
Application and Design Courses	29.33%
Engineering Culture	4 %
Business Administration	2.66 %
Projects and Practice	% 6

A. List of Humanities and Social Science Courses (625 Marks) 8.3%

HUM 051	English Language I	75
HUM 052	English Language II	75
HUM 053	Human Rights	75
HUM 054	Health, safety and Risk Assessment	75
HUM 151	Technical Writing	100
HUM 352	Foundations of Management	75
HUM 353	Macroeconomics	75
HUM 451	Critical Thinking	75

B. List of Basic Science and Mathematics Courses (1475 Marks) 19.6%

BAS 021	Engineering Statics	125
BAS 022	Calculus	125
BAS 023	Linear Algebra	125
BAS 031	Physics I	125
BAS 032	Physics II	125
BAS 041	General Chemistry	100
BAS 042	Engineering Chemistry	125
BAS 121	Calculus in Several Variables	125
BAS 122	Kinematics and Dynamics	125
BAS 123	Ordinary Differential Equations	125
BAS 124	Probability and Statistics	125
BAS 131	Engineering Physics	125



C. List of Basic Engineering Science Courses (2250 Marks) 30%

AUT 011	Engineering Drawing	125
AUT 012	Production Technology & Workshops	125
AUT 111	Thermodynamics	125
AUT 211	Heat Transfer	125
AUT 212	Fluid Mechanics	125
AUT 213	Fluid Power and Control	125
AUT 214	Strength of Materials & Stress analysis	125
AUT 215	Mechanical Vibrations	125
COM 111	Logic Circuits	125
COM 112	DC Circuit Analysis	125
COM 212	Electronics Principles I	125
COM 213	Measurements and Control Elements	125
COM 216	Automatic Control	125

D. Computer Applications Courses

COM 131	Introduction to Programming	100
COM 132	Graphics and Computer-Aided Drawing	100
COM 133	Programming I	100
COM 231	Algorithms and Data Structures I	100
COM 232	MATLAB	100
COM 431	Computerized Maintenance Management Software	125



E. Technical Core in Automotive Engineering (2200 Marks) 29.3%

AUT 221	Automotive Engines	125
AUT 320x	Elective 1	125
AUT 320x	Elective 2	125
AUT 321	Automotive Engineering	100
AUT 322	Automotive Electrical & Electronic Systems	125
AUT 323	Suspension and steering Systems	125
AUT 324	Vehicle Dynamics	125
AUT 325	Automotive Transmission systems	125
AUT 326	Braking Systems	125
AUT 327	Electrical Vehicle	100
AUT 420x	Elective 3	125
AUT 420x	Elective 4	125
AUT 421	Computerized Engine Control systems	125
AUT 422	Chassis Design	125
AUT 423	Fuel Injection and Electronic Ignition Systems	125
AUT 425	Hybrid, and Fuel Cell Vehicles	125
AUT 426	Chassis Control systems	125
AUT 427	Automotive Intelligent Systems	125

F. Engineering culture BAS x7x (300 Marks) 4%

BAS 171	Environmental Management	100
BAS 371	Engineering Management	100
BAS 372	Operation Researches	100

G. Business Administration BAS x8x (200 Marks) 2.66%

BAS 281	Project Management	100
BAS 081	Fundamentals of Marketing	100

H. Project & Training. (450 Marks) 6 %

AUT 299	Internship	75
AUT 399	Internship	75
AUT 499	Capstone Project	300



6- Study Plan

Automotive Engineering Preparatory year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 011	Engineering Drawing	1	4	-	5	50	-	-	75	125	4
BAS 021	Engineering Statics	2	2	-	4	50	-	-	75	125	3
BAS 023	Linear Algebra	2	2	-	4	50	-	-	75	125	3
BAS 031	Physics I	2	-	2	4	25	-	25	75	125	3
BAS 041	General Chemistry	2	-	2	4	20	-	20	60	100	3
HUM 051	English Language I	2	-	2	4	15	15	-	45	75	2
HUM 053	Human Rights	2	-	-	2	25	-	-	50	75	2
Total		13	8	6	27						750

Automotive Engineering Preparatory year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 012	Production Technology & Workshops	2		4	6	25	-	25	75	125	3
BAS 022	Calculus	2	2	-	4	50	-	-	75	125	3
BAS 032	Physics II	2	-	2	4	25	-	25	75	125	3
BAS 042	Engineering Chemistry	2	-	2	4	25	-	25	75	125	3
BAS 081	Fundamentals of Marketing	2	1	-	3	30			70	100	3
HUM 052	English Language II	2	-	2	4	15		15	45	75	2
HUM 054	Health, Safety and Risk Assessment	2	1		3	25	-	-	50	75	2
Total		14	4	10	28						750



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Automotive Engineering- 1st Year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
BAS 121	Calculus in Several Variables	2	2	-	4	50	-	-	75	125	3
BAS 122	Kinematics and Dynamics	2	2	-	4	50	-	-	75	125	3
BAS 131	Engineering Physics	2	2	-	4	50	-	-	75	125	3
COM 111	Logic Circuits	2	2		4	25	-	25	75	125	3
COM 131	Introduction to Programming	2	-	2	4	20	-	20	60	100	3
COM 132	Graphics and Computer-Aided Drawing	2	-	4	6	20	-	20	60	100	3
Total		12	8	6	26					700	

Automotive Engineering 1st Year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 111	Thermodynamics	2	2	-	4	50	-	-	75	125	3
BAS 123	Ordinary Differential Equations	2	2	-	4	50	-	-	75	125	3
BAS 124	Probability and Statistics	2	2	-	4	50	-	-	75	125	3
BAS 171	Environmental management	2	1		3	40			60	100	3
COM 112	DC Circuit Analysis	2	2	2	6	25	-	25	75	125	3
COM 133	Programming I	2	-	2	4	20	-	20	60	100	3
HUM 151	Technical Writing	2	-	1	3	20	-	20	60	100	2
Total		14	9	5	28					800	



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Automotive Engineering- 2nd Year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 212	Fluid Mechanics	2	2	-	4	50	-	-	75	125	3
AUT 211	Heat Transfer	2	2	-	4	50	-	-	75	125	3
BAS 281	Project Management	2	2		4	40			60	100	2
COM 216	Automatic Control	2	2	-	4	50	-	-	75	125	3
COM 212	Electronics Principles I	2	2	2	6	25	-	25	75	125	3
COM 231	Algorithms and Data Structures I	2	-	2	4	20	-	20	60	100	3
Total		12	10	4	26					700	

Automotive Engineering 2nd Year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 213	Fluid Power and Control	2	2	-	4	50	-	-	75	125	3
AUT 214	Strength of Materials & Stress analysis	2	2	-	4	50	-	-	75	125	3
AUT 215	Mechanical Vibrations	2	2	-	4	50		-	75	125	3
AUT 221	Automotive Engines	2	-	4	6	25	-	25	75	125	3
AUT 299	Internship									75	
COM 213	Measurements and Control Elements	2	2	2	6	25	-	25	75	125	3
COM 232	MATLAB	2	-	2	4	25	-	25	50	100	3
Total		12	8	8	28					800	



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Automotive Engineering- 3rdYear- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 320x	Elective 1	2	2	-	4	50		-	75	125	3
AUT 321	Automotive Engineering	2	2	-	4	40	-	-	60	100	3
AUT 322	Automotive Electrical & Electronic Systems	2	-	2	4	25	-	25	75	125	3
AUT 323	Suspension and Steering Systems	2	-	2	4	25		25	75	125	3
BAS 371	Engineering Management	2	1		3	40			60	100	3
HUM 352	Foundations of Management	2	2	-	4	25	-	--	50	75	2
HUM 353	Macroeconomics	2	0	-	2	25	-	-	50	75	2
Total		14	7	4	25					725	

Automotive Engineering- 3rdYear- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 320	Elective 2	2	2		4	50			75	125	3
AUT 324	Vehicle Dynamics	2	2	-	4	50	-	-	75	125	3
AUT 325	Automotive Transmission Systems	2	-	3	5	25	-	25	75	125	3
AUT 326	Braking Systems	2	-	2	4	25	-	25	75	125	3
AUT 327	Electrical vehicle	2		2	4	20		20	60	100	3
AUT 399	Internship									75	
BAS 372	Operation Researches	2	2		4	50			50	100	2
Total		12	6	7	25					775	

Elective Courses (AUT 320)

Elective1

AUT 320A Electromechanical Energy Conversion
AUT 320B Production Cost Analysis

Elective 2

AUT 320C Engineering Thermodynamics
AUT 320E Fundamental of Power System



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Automotive Engineering- 4th Year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 421	Computerized Engine Control systems	2	-	4	6	25	-	25	75	125	3
AUT 422	Chassis Design	2	3	-	5	50	-	-	75	125	4
AUT 423	Fuel Injection and Electronic Ignition Systems	2	-	2	4	25	-	25	75	125	3
AUT 429A	Elective 3	2	2	-	4	50	-	-	75	125	3
AUT 499	Capstone Project	1	-	4	5	Continuous				-	-
COM 431	Computerized Maintenance Management Software	2		2	4	25	-	25	75	125	3
Total		12	5	11	28					625	

Automotive Engineering- 4th Year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 420x	Elective 4	2	2	-	4	50	-	-	75	125	3
AUT 425	Hybrid, and Fuel Cell Vehicles	2	2	-	4	50	-	-	75	125	3
AUT 426	Chassis Control systems	2	-	2	4	25	-	25	75	125	3
AUT 427	Automotive Intelligent Systems	2	-	4	6	25	-	25	75	125	3
AUT 499	Capstone Project	1	-	6	7	150	150	-	-	300	-
HUM 451	Critical Thinking	2	-	-	2	25	-	-	50	75	2
Total		11	4	12	27					875	

ECTIVE:

Elective course 3

AUT 420A Intelligent Control Systems

AUT 420B Energy Storage Systems

Elective course 4

AUT 420C Combustion Technology

AUT 420D Quality Control



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Automotive Engineering

Course Description

Basic Engineering Science Courses



AUT 011	Engineering Drawing	Lecture : 1	Tutorial: 4	Lab: 0
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Specific Goals:

- Understand working drawings in ISO standards together with any written instruction.
- Knowledge of standards for conventional dimensioning and tolerancing, and geometric dimensioning and tolerancing appropriate to the ISO standards.
- Understand the rules of technical drawing and the prevailing latest ISO standards that govern those rules
- Using the manuals, tables, lists of standards and product catalogues

Learning Outcomes

1. Use various drawing instruments
2. Define Bases for interpreting Drawings
3. Sketching Missing Views
4. Sketching Three Views
5. Sketching Pictorial Views
6. Writing Dimensioning on Drawings
7. Matching Drawings
8. Using Abbreviations on Drawings
9. Sketching Circular Features
10. Sketching Inclined Surfaces Features
11. Writing Dimensions on Cylindrical Holes
12. Sketching Full Sections
13. Sketching Half Sections

NARS ATTRIBUTES: 1, 2, 5

Contents:

- Drawing Instruments
- Lettering
- Geometric Construction
- Freehand Sketching
- Orthographic Projection with Instruments
- Primary Auxiliary Views
- Sections
- Dimensioning
- Tolerances
- Working Drawings

TEXTBOOKS:

1. Engineering Design Graphics: Sketching, Modeling, and Visualization, by James Leake and Jacob Borgerson



AUT 012	Production Technology & Workshops	Lecture : 2	Tutorial: 0	Lab: 4
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Specific Goals including practices in workshop

- To introduce students to the role of manufacturing in an economy and to show the relationship between design and manufacturing.
- To make students aware of the necessity to manage manufacturing processes and systems for the best use of material and human resources with particular emphasis on product safety and environmental considerations
- To introduce students to the scientific principles underlying material behavior during manufacturing processes
- To build up practical skills necessary to perform basic concepts of manufacturing via shaping, forming, machining, and assembly
- To develop a knowledge of appropriate parameters to be used for various machining operations
- To develop a knowledge of workshop practice and basic use of machine tools and workshop equipment.

NARS ATTRIBUTES: 1, 4, 6

LEARNING OUTCOMES

On successful completion of this course, students should be able to:

- Analyze various machining processes and calculate relevant quantities
- Have a basic knowledge of safe workshop practice and the environmental implications of machining process decisions
- Identify and explain the function of the basic components of a machine tool
- Understand the limitations of various machining processes with regard to shape formation and surface quality and the impact this has on design
- Understand the procedures and techniques involved for the manufacturing of components, and keep up to date with innovation through literature search.
- Carry out simple machining operations based on machining drawings

Contents:

Introduction to Engineering materials – Metallic and non-metallic materials – cast iron and steel furnaces – metal casting – metal forming – extrusion – bending – welding – turning – milling – shaping – drilling – simple measurement tools – production quality – practical hand skills in the workshop- introduction to industrial safety.

TEXT:

A Textbook of Workshop Technology: Manufacturing Processes, S. Chand Limited, Jan 1, 2008



AUT 111	Thermodynamics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is designed to enable students to analyze and evaluate various thermodynamic cycles used for energy production - work and heat, within the natural limits of conversion.

Practical & Professional Skills (Lab/ workshop work)

At the completion of this course, students will be able to

- To state the First Law and to define heat, work, thermal efficiency and the difference between various forms of energy.
- To identify and describe energy exchange processes (in terms of various forms of energy, heat and work) in aerospace systems.
- To explain at a level understandable how various heat engines work (e.g. a refrigerator, an IC engine, a jet engine).
- To apply the steady-flow energy equation or the First Law of Thermodynamics to a system of thermodynamic components (heaters, coolers, pumps, turbines, pistons, etc.) to estimate required balances of heat, work and energy flow.

In relation to NARS (The Attributes of the Engineers, section 1.2)

NARS ATTRIBUTES: 1, 3

Contents (Lectures + Tutorial)

Basic fundamentals and definitions – Energy concepts–Open and Closed systems – Energy equation for closed systems – Continuity equations – Energy equation for open systems – Steady and unsteady flow through open systems – Properties of pure substance – Ideal gas model – Reversible processes – Irreversible processes – First law of thermodynamics – Second law of thermodynamics – Carnot cycle – Heat engines and efficiency – Entropy – Entropy change – Properties of gas mixture and vapors – Enthalpy and internal energy of gas and vapors mixture– Laboratory Experimental.

TEXT:

Tipler & Mosca, Physics for Scientists and Engineers, 2008, McDermott, Shaffer ET. al., Tutorials in Introductory Physics, Updated Preliminary 2nd Edition 2011-2012



AUT 211	Heat Transfer	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is designed to introduce a basic study of the phenomena of heat and mass transfer, to develop methodologies for solving a wide variety of practical engineering problems, and to provide useful information concerning the performance and design of particular systems and processes.

Practical & Professional Skills

Upon completion of the subject, students will be able to:

- Understand the basic laws of heat transfer.
- Account for the consequence of heat transfer in thermal analyses of engineering systems.
- Analyze problems involving steady state heat conduction in simple geometries.
- Develop solutions for transient heat conduction in simple geometries.
- Obtain numerical solutions for conduction and radiation heat transfer problems.
- Understand the fundamentals of convective heat transfer process.
- Evaluate heat transfer coefficients for natural convection.
- Evaluate heat transfer coefficients for forced convection inside ducts.
- Evaluate heat transfer coefficients for forced convection over exterior surfaces.
- Analyze heat exchanger performance by using the method of log mean temperature difference.
- Analyze heat exchanger performance by using the method of heat exchanger effectiveness.
- Calculate radiation heat transfer between black body surfaces.
- Calculate radiation heat exchange between gray body surfaces.

NARS ATTRIBUTES: 1, 2, 4

Contents

Introduction to heat transfer- Steady-state one dimensional conduction heat transfer - One dimensional conduction heat transfer with heat generation - Heat transfer from extended surface and fins-Transient Heat Conduction- Fundamentals of Convection Heat Transfer- Forced Convection relations (external flow) - Forced Convection relations (internal flow) - Free Convection relations – Thermal radiation– Laboratory Experimental.

TEXT:

1. Y.A. Cengel and A.J. Ghajar, Heat and Mass Transfer: Fundamentals and Applications, McGraw-Hill, latest edition.
2. J.P. Holman, Heat Transfer, McGraw Hill, latest edition.
3. F.P. Incropera, D.P. Dewitt, T.L. Bergman and A.S. Lavine, Principles of Heat and Mass Transfer, John Wiley & Sons, Inc., latest edition.



AUT 212	Fluid Mechanics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course aims to introduce the student to the fundamentals fluid mechanics and its applications in process engineering. The focus will be on solving fluid flow problems and design of pipeline and equipment for fluid transportation.

Practical & Professional Skills (Lab/ workshop work)

At the completion of this course, students will be able to

- Demonstrate their understanding of the basic principles of static and fluid systems;
- Perform a basic analysis of static and fluid systems;
- Devise simple solutions to a range of problems in basic fluid flow;
- Present their understanding and analysis of problems using methodical and clearly demonstrated worked solutions;
- Use appropriate modelling tools to design pipelines and equipment;
- Undertake basic design calculations of fluid engineering systems; and
- Understand and articulate the principles that are in operation in a range of fluid motive and flow measuring devices.

NARS ATTRIBUTES: 1, 2, 4

Contents

Introduction – Fluid Principles Definitions – Fluid statics – Fundamentals of fluid motion – Fluid kinematics – Principal equations for mass continuity, energy conservation, and momentum in integral formula – Applications – Dimensional analysis and similarity – Laminar & Turbulent flow – Laminar flow cases – Steady flow in pipelines – Friction coefficient and losses – Minor losses – Methods of nets connection – Differential form of continuity and motion – Approximate and Analytical solutions – Flow through boundary layer – Potential flow theory – Flow around immersed bodies – Unsteady flow – Introduction to flow control – Introduction to computational fluid mechanics– Laboratory Experimental.

TEXT:

Franzini and Finnemore, Fluid Mechanics, 10 the Edition, McGraw-Hill,
ISBN: 0-07-243202-0



AUT 213	Fluid Power and Control	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course deals with theory, operation and application of industrial hydraulic and pneumatic systems. Emphasis is placed on component and system operation using practical lab applications. Maintenance, troubleshooting and electrical control of fluid power are included.

Practical & Professional Skills (Lab/ workshop work)

1. Identify hydraulic and pneumatic components.
2. Construct simple hydraulic and pneumatic circuits.
3. Apply rules relative to linear actuators for pressure, volume, flow and velocity.
4. Apply directional control valves in hydraulic and pneumatic circuits.
5. Calculate quantities related to the operation of hydraulic and pneumatic motors.
6. Apply pressure control valves and accumulators in operating hydraulic and pneumatic circuits.
7. Construct and test electrically controlled hydraulic and pneumatic circuits.

NARS ATTRIBUTES: 1,2,3,4

Contents

Introduction to fluid power - Hydraulic principles - Fluid for hydraulic systems - the basic components and functions of hydraulic and pneumatic systems and its standard symbols (Fluid control valves - Hydraulic pumps - Hydraulic motors - Auxiliary hydraulic devices – Design, operation, troubleshooting and applications of Hydraulic circuits (hydraulic coupling and torque convertor etc.) – air preparation and component, Pneumatic circuits and – Fluid logic control systems - Basic electrical control for fluid power circuits.

TEXT:

Fluid Power: Hydraulics and Pneumatics, 2nd Edition, James R. Daines



Specific Goals:

The underlying objective of this course is to teach students how to formulate solutions to problems requiring the application of suitable engineering theories for strength of material and stress and strain;

Practical & Professional Skills

- Explain and apply advanced knowledge of components in terms of principles of strength of materials
- Apply appropriate design standards to engineering problem
- Analyze systems under load

NARS ATTRIBUTES: 1, 2, 4

Contents (Lectures)

Material mechanical properties such as strength ductility toughness and strain energy -Concept of stress and strain analysis - Stress-strain Diagram – Types of Loads and forces - Equilibrium of simple mechanical elements-normal and shear forces – bending and torsion moments – stresses in loaded elastic bars- axial, bending, torsion-strains-rigidity-strain energy-stresses in combined loading-eccentric loads, inclined, bending and torsion-two-dimensional stresses-principle stresses-Mohr circle-theory of failure-applications: thin and thick cylinders-frames-and finite elements. Analysis and design of Beams for Bending - Beam Section Properties - Symmetric member in pure bending- Bending deformations –Shear stress and strain due to bending - Shear and Bending Moment Diagrams- Shearing Stresses in Beams- Transformations of Stress and Strain- Deflection of Beams Hardness Definition and hardness test. Behavior of materials under dynamic loads Fatigue and impact. Laboratory test - Tensile test - Compression test - Bending test - Shear test -Hardness test - Impact test - Torsion test- Fatigue test - Creep test.

TEXT:

2001.E.J. Hearn. Mechanics of Materials (3rd Ed).UK: Butterworth-Heinemann



AUT 215	Mechanical vibrations	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course introduces students to theory and application of mechanical vibrations. It includes damped and undamped vibrations with one or more degrees of freedom. Computer methods are emphasized.

Practical & Professional Skills (Lab/ workshop work)

- Understand the concept of lumped parameter analysis to represent a system as a set of masses, springs and dampers
- Evaluate the vibration characteristics of the system.
- Write Equations of motion of simple 1 and 2 degree of freedom quarter car model
- Evaluate the steady state response
- Evaluate the frequency response
- Evaluate the step response
- Use computers to obtain solutions for systems in which the external forcing function is non-periodic

NARS ATTRIBUTES: 1,2,3,4

Contents

Fundamental aspects of mechanical vibrations -Types and causes of various vibratory motions - free vibrations of un-damped and damped systems - Natural frequency and damping ratio - Harmonically excited vibrations - The theoretical aspects of general periodic vibrations and non-periodic vibrations are formulated by means of Fourier analysis and convolution integral. Vibrations of multiple degrees-of-freedom systems - Equations determining the natural frequencies and mode shapes of the system - Harmonically excited vibrations - Vibration control in relation to engineering design -Various vibration control concepts and techniques - The concepts of mathematical modeling of the vibratory systems.

TEXT:

Mechanical Vibrations by S. S. Rao, 4th Edition, Pearson-Prentice Hall, Upper Saddle River, NJ, 2004



COM 111	Logic Circuits	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

This course develops skills in the area of Boolean algebra and in the application of this mathematical area to practical digital engineering problems. Specifically the course is designed to bridge the area of Boolean algebra with digital circuits, since students learn to design and debug these circuits using tools and methodologies that are consistent with modern engineering practice (CPLDs and programming tools for them). Students also learn to build simple circuits and to construct more complex designs based hierarchically on these.

Learning Outcomes

The Student will be able:

- Representation of digital information: Number systems
- The basic logical operations: Truth tables

NARS ATTRIBUTES: 1, 2, 3

Contents

- Boolean algebra-
- Algebraic simplification
- Minterm and maxterm expansions
- Karnaugh maps
- Multi-level gate networks
- Multiple-output logic: Multiplexers, decoders, read-only memories, programmable logic arrays
- Combinational network design
- Flip-flops: Registers and information transfer
- Sequential network analysis and realization
- State tables: Reduction of state tables
- Introduction of asynchronous sequential networks

TEXT: Fundamentals of Logic Design. Roth, Jr./Kinney. 2013.



COM 112	DC Circuit Analysis	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

This course introduces students to basic concepts of Electrical Engineering. Critical aspects in the professional education as the strategies to identify and solve technical problems, communication skills, ethics and the capability to work in teams are also addressed during the course.

The Student will be able to:

- use node and mesh analysis, source transformation and linearity to determine node voltage and loop currents
- find Thevenin and Norton Equivalent Circuits
- analyze basic OpAmp circuits
- analyze measurements
- perform of lab and measurement procedures
- write lab reports
- understands role of modeling and simulation

NARS ATTRIBUTES: 1,2,3,4

Contents

Basic concepts: System of units. Charge, current and voltage. Power and energy. Circuit elements

Basic Laws: Ohm's Law. Kirchhoff's Law. Series and parallel resistors.

Analysis: Nodal analysis. Mesh analysis

Circuit Theorems: Linearity. Superposition. Thevenin's theorem. Norton's theorem

Operational amplifiers: Introduction. Ideal Op Amp

Capacitors and inductors: Introductory ideas. Series and parallel capacitors. Series and parallel inductors.

Step response RC/RL circuits- Step response RLC circuits

Lab:

- Introduction to laboratory. Department rules, procedure, policies. Proper way to write a laboratory report. Safety Considerations, nature of voltage, current and resistance..
- Use of meters and the Feedback Kit Experiment
- Ohm's Law.
- Kirchhoff's Law
- Troubleshooting of Series and parallel Circuits. (resistance measurements)
- Troubleshooting of Series and parallel Circuits. (voltage measurements)
- Superposition
- Thevenin's Theorem
- Norton's theorem
- Ideal Op Amp
- RC/RL circuits
- RLC circuits



TEXT: Mario C. Marconi & Stephen V. Milton, Fundamentals of Electric Circuits. Alexander, Charles & Sadiku, Matthew. 2012.

COM 212	Electronics Principles I	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

Students will gain an understanding of the electrical properties of semiconductor devices, their models and their use in circuits. They will learn fundamental concepts necessary to analyze and design amplifiers and contemporary electronic circuits using diodes and MOSFETs.

The Student will be able to:

- Perform Analysis and design using models
- express diode, MOSFET and BJT regions of operation by function and bias
- determine region of operation, bias points
- determine equivalent circuits for any region
- depict common gate, drain, and source configurations
- analyze circuits for transfer functions of voltage, current and transconductance
- determine 2nd harmonic distortion for single stage amplifiers with sinusoid inputs
- derive full expression for CS or CE configuration frequency response
- show relationship to open-circuit time constant and Miller effect approximation
- simulate circuits
- use simulation to confirm hand calculations for rectifier, single stage amplifiers, and simple inverters
- edit pSPICE models so that models match measurements

For Laboratory procedures: measurement, analysis, and reporting

- connect devices and evaluate bias circuits and timevarying behavior
- analyze measurements and display results in Bode plots for transfer functions
- extract device properties (e.g. threshold voltage) from measured data
- use LabView to derive I-V characteristics of devices and
- customize Vi's for processing laboratory information

NARS ATTRIBUTES: 1, 3

Contents

Introduction to semiconductor material properties; semiconductor diodes: structure, operation, and circuit applications; special diodes: Zener, LED, Solar cell and photodiode; Metal Oxide Field Effect Transistors (MOSFETs): structure, operation, and circuit applications; Bipolar Junction Transistor: structure operation, and circuit applications. Thyristors: Structure and I-V characteristics.

Lab: Introduction to the lab tools, I-V characteristics of diode, clipping circuits using diodes, rectification using diodes, Zener diode and regulators, BJT DC biasing, CE BJT amplifier. MOSFET DC biasing, CS MOSFET amplifier, simple AM receiver circuit.

TEXT: Microelectronic Circuits. Adel Sedra& Kenneth Smith. 2009



COM 213	Measurements and Control Elements	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

This course is designed to Develop the ability of the students to apply the fundamental concepts of measurements required to control various mechanical systems, electrical systems and electro-mechanical systems this ability is demonstrated by solving well-posed, closed-ended homework and exam problems.

Learning Outcomes

On successful completion of this course, students should be able to:

- Demonstrate an ability to apply fundamental concepts and problem-solving techniques to solve "real-world" problems. This ability is demonstrated by working in groups to develop solutions for open-ended problems.
- Evaluate laboratory measurement errors and uncertainties and their impacts on engineering predictions. This is accomplished by collecting data in laboratory experiments concerning the use of various sensors and signal conditioning systems.

NARS ATTRIBUTES: 1, 3,5,14

Covered:

Sensors and transducers: Performance terminology- Displacement, position and proximity sensors- Velocity and motion sensors- Force sensors- Fluid pressure sensors- Liquid flow sensors- Liquid level sensors- Temperature sensors- Light sensors- Selection of sensors

Signal conditioning: Signal conditioning- The operational amplifier- Protection- Filtering- Pulse modulation

Data presentation systems: Displays- Data presentation elements- Magnetic recording- Optical recording- Displays- Data acquisition systems- Measurement systems- Testing and calibration

Pneumatic and hydraulic actuation systems: Actuation systems- Pneumatic and hydraulic systems- Directional control valves- Pressure control valves- Cylinders- Servo and proportional control valves- Process control valves- Rotary actuators-

Mechanical actuation systems: Mechanical systems Types of motion- Kinematic chains- Cams- Gear trains- Ratchet and pawl- Belt and chain drives- Bearings

Electrical actuation systems: Electrical systems- Mechanical switches- Solid-state switches- Solenoids- D.C. motors- A.C. motors- Stepper motors- Motor selection

Lab:

Students will use basic instruments to carry out real time measurements that are necessary to familiarize them with the advanced concepts and updated technology in the measurements and control field. Experiments are organized in several groups of real time applications such as temperature, pressure, and level measurements. Applications are extended to cover data processing.

TEXTBOOK: Mechatronics: Electronic control systems in mechanical and electrical engineering, W. Bolton, 2011, ISBN 13-9780273742869

COM 216	Automatic Control	Lecture : 2	Tutorial: 2	Lab:0
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Specific Goals:



To provide students with the fundamental knowledge of controller design for automatic control systems

Practical & Professional Skills (Lab/ workshop work)

Upon completion of the subject, students will be able to:

- Formulate and solve problems relating to modeling of linear mechanical systems, analysis of system relative stabilities; determining specifications for open- or closed-loop control systems and designing controllers or compensators for mechanical systems.
- Complete a given task such as a project in system modeling or controller design by applying knowledge acquired in the subject and information obtained through literature search.
- Analyze and interpret data obtained from experiments in system modeling, stability analysis or frequency-domain analysis of mechanical systems.
- Present effectively in completing written reports of laboratory work and the given task.

NARS ATTRIBUTES: 1, 2, 4

Contents

Review of mathematical background (complex variables, Laplace, Diff. Equations); System representation (block diagram, transfer functions, signal flow graph) Modeling of electric and mechanical systems; State variable analysis; Stability; Time domain analysis; Root locus; Bode diagram, Nyquist diagram, Frequency domain analysis; Introduction to PID control.

TEXTS:

1. M. Gopal, Control Systems, Principles and Design, McGraw-Hill, latest edition.
2. N.S. Nisei, Control Systems Engineering, Wiley, latest edition.
3. K. Ogata, Modern Control Engineering, Prentice Hall, latest edition.



وزارة التعليم العالي
المعهد العالي للهندسة و تكنولوجيا السيارات و الطاقة بهيليوبليس الجديد

COM 299	Internship	Lecture :	Tutorial: 0	Lab: 0
		160 after the 2 rd year		

Specific Goals:

Students will spend additional time practicing skills in a work environment in order to fulfil Training Package assessment requirements.

Practical & Professional Skills (Lab/ workshop work)

Learning in the workplace will enable students to:

- progress towards the achievement of industry competencies
- develop appropriate attitudes towards work
- learn a range of behaviors appropriate to the industry
- practice skills acquired in the classroom or workshop
- develop additional skills and knowledge one

NARS ATTRIBUTES: 6, 9,11,13,14

Contents

The Internship I in Automotive Engineering is comprised of 160 hours of work experience in a related dealership requiring the student to perform a variety of tasks. The student will be required to work eight hours per day for eight weeks. A training agreement between the employer and the college is required, as is a weekly summary of activities (tasks performed) prepared by the student

TEXTS: None



وزارة التعليم العالي
المعهد العالي للهندسة و تكنولوجيا السيارات و الطاقة بهيليوبليس الجديد

Automotive Engineering

Course Description

Engineering Application and Design courses



AUT 221	Automotive Engines	Lecture : 2	Tutorial: 0	Lab: 4
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Specific Goals:

The course introduces automotive engine theory and repair, placing emphasis on theories, new technologies in the area, inspection, testing, and diagnostic techniques.

Practical & Professional Skills(including Lab/ workshop work)

1. Use and Maintain Tools and Measuring Equipment
2. Measure and analyze Engine Performance Parameters
3. Carry out Engines Compression test and Analyze Results
4. Diagnose Oil Pressure Problems.
5. Diagnose Cooling System Problems
6. Perform Crack Inspection.
7. Perform Valve Guide Inspection.
8. Adjust Timing of the Cam to the Crank.
9. Checking Crank Condition and Engine Balancing
10. Use Workplace Technical Documents
11. Write Technical Reports

NARS ATTRIBUTES: 1,2,3,4

Contents

Ideal cycles, actual cycles, deviation of actual cycles from ideal cycles in spark and compression ignition engines. Engine classifications. Thermal efficiency, characteristics of fuels, chemistry and combustion; airflow requirements; air-fuel ratios. Normal and abnormal combustions. Combustion Chamber Designs. Rating of Octane and Cetan numbers. Engine breathing and volumetric efficiency. Operations and main components. General diagnosis of engines; inspection, diagnosis, and repair of cylinder heads, valve trains, engine blocks, lubrication and cooling systems- routine and periodic inspection and maintenance operations. Measurement of torque, power, speed and fuel consumption; acceptance and type tests, accuracy of the measurements

TEXT:

Automotive Engines, 7th Edition, Tim Gilles Santa Barbara City College, Santa Barbara, California, ISBN-10: 1285441745.

AUT 320A ENG 320 A	Electromechanical Energy Conversion	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

The course aims at developing a general understanding of energy systems with focus on understanding and analyzing energy conversion including system design and theory of operation. The course also focuses on understanding the environmental consequences of energy conversion.

In relation to NARS (The Attributes of the Engineers,2009)

9,10,11

Contents

Transformers (construction, operation of single-phase transformers, equivalent circuit, voltage regulation and efficiency, auto-transformer, three-phase transformers), AC machinery fundamentals, three-phase induction machines (construction, operation, equivalent circuit, performance, calculations, starting of induction motors, speed control), small AC motors (single-phase induction motors, reluctance and hysteresis motors, universal motors, servo motors, stepper motors).

Textbook:

Fundamentals of Electromechanical Energy Conversion

AUT 320B ENG 320 B	Production Cost Analysis	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

In relation to NARS (The Attributes of the Engineers,2009)

9,10,11

Contents

Analysis of cost elements; cost centers; computer based production cost systems; production cost for linear and nonlinear production systems; minimum and maximum break-even output levels; average cost output level; profits and sales revenues levels; cost control..

AUT 320C ENG 320 C	Engineering Thermodynamics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

In relation to NARS (The Attributes of the Engineers,2009)

9,10,11



Contents

.. Fundamental concepts - Properties of a pure substance – Equation of state - thermodynamic systems - Work and heat - First law of thermodynamics; Applications to Systems and Control Volumes - Second Law of Thermodynamics; Principle of Carnot cycles; Heat engines, Refrigerators and heat pumps - Principle of the increase of entropy - Applications to systems and control volumes - Irreversibility and availability - Power and refrigeration cycles.

Text Books

Thermodynamics: An Engineering Approach (Mechanical Engineering) 8th
Edition by Yunus Cengel (Author), Michael Boles (Author)

AUT 320D	Fundamental of Power System	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course will teach basic power generation, transmission and distribution, with the perspective of increased energy efficiency in both generation and consumption of electrical energy.

In relation to NARS (The Attributes of the Engineers, section 1.2)

1,3,9,11

Contents (Lectures)

Power system components and representation. Transmission line and cable parameters. Per Unit calculations. Analysis of transmission and distribution lines. Electric insulators. Grounding systems. High voltage surges. Protection system.

Textbook:

Power System Analysis and Design (Activate Learning with these NEW titles from Engineering!) By J. Duncan Glover, Thomas Overbye, Mulukutla S. Sarma

AUT 321	Automotive Engineering	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

Automotive engineering is one of core subjects in automotive Engineering in universities worldwide. Although road vehicles can be classified into various types based on different purposes, such as the single vehicle, sedan, passenger car, truck and special purpose vehicle, it is the rubber single tire, single axle, four-wheel vehicle that defines the study object of this course. Based on this case, the traction and brake, ride and handling dynamics theory, as well as theory and design of vehicle control system are presented.

Practical & Professional Skills



1. Develop a rudimentary understanding of how the automotive industry operates
2. Calculate dynamic wheel loads as influenced by accelerations, grades, aerodynamics and towed vehicles]
3. Understand power train function and the translation of torques and speeds throughout
4. Design and proportion a brake system
5. Understand the nature of aerodynamic and rolling resistance forces exerted on the vehicle and its implications on fuel economy
6. Understand the fundamentals of ride excitation sources and how to tune vehicle responses for best ride
7. Determine understeer properties based on tire, suspension and steering system properties
8. Knowledge of various suspension types and methods of analysis to determine their essential properties
9. Acquire a vocabulary for communicating with automotive engineers

NARS ATTRIBUTES: 9,11,12,13,14,15,16

Contents

1. Introduction: brief history and development of the subject, desirable vehicle properties, vehicle design philosophy, terminology and legislation;
2. Braking and Traction: basic equation of motion, aerodynamic forces and moment, tire rolling resistance, acceleration and grade ability performances, braking performances and ABS design, Ride: road surfaces, suspension components and tire ride properties, vehicle ride models, human response to vibration,;
3. Handling: tire properties, driver-vehicle close loop system, basic handling model, linear handling results, and extensions to the basic handling model.

TEXT:

Fundamentals of Vehicle Dynamics by Gillespie



AUT 322	Automotive Electrical & Electronic Systems	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

The course introduces theory of operation, design requirements and constraints of Automotive Electrical & Electronic Systems including batteries, starting systems, alternators, and regulators and lighting systems. The course also emphasizes the functions of systems and components, measurements and analysis of performance parameters, diagnosis, and service/repair and current and voltage tests

Practical & Professional Skills (Lab/ workshop work)

1. Use and Maintain Tools and Measuring Equipment
2. Read and interpret wiring diagrams
3. Diagnose and fix lighting system faults
4. Measure and analyze Performance Parameters of Starting and Charging Systems
5. Carry out standard tests of Starting and Charging Systems and Analyze Results
6. Analyze Fault Symptoms
7. Build up Diagnostic Strategies
8. Diagnose Starting and Charging Systems Problems.
9. Perform Post-repair work
10. Use Workplace Technical Documents
11. Write Technical Reports

NARS ATTRIBUTES: 9,11,12,13,14,15,16

Contents

Acid batteries, function and theory of operation, charging procedures, performance parameters. Starting system: components, functions, performance parameters, design requirements, various types, standard tests, diagnosis and repair work. Alternators and regulators: components, functions, performance parameters, design requirements various types, standard tests, diagnosis and repair work. Standard electric systems and Lighting systems: wiring diagrams, components, fault diagnosis and repair work

TEXT: Automobile Electrical and Electronic Systems, 4th Ed Paperback – 20 Feb 2012, by Tom Denton



AUT 323	Suspension and Steering Systems	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

The course introduces students to principles of steering and suspension systems. Emphasizes are placed on modern technologies in both systems. Theoretical topics are linked to practical skills, by which the student will be able to solve automotive engineering problems related to this area of specialization.

Practical & Professional Skills (Lab/ Lecture)

1. Understanding of theory and operation of automotive suspension and steering systems
2. Diagnosis and service of bearings, seals, wheel hubs, front and rear drive axle assemblies
3. Diagnosis, service, and replacement of shock absorbers, front and rear struts, cartridges, and coil spring assemblies.
4. Front suspension system diagnosis and service including curb height measurements, control arms, and transversely mounted torsion bars.
5. Rear suspension system diagnosis and service of control arms, ball joints, leaf-springs, track bars, stabilizer bars, strut rod and adjusting links.
6. Develop an understanding of theory and diagnosis of computer-controlled suspension systems: Electronic air suspension, rear load-leveling, computer controlled ride control, and automatic air suspension systems.
7. Diagnosis and service of manual-power rack and pinion steering gear assemblies.
8. Diagnosis, measurement, and adjustments of caster and camber alignment angles.
- 10 Diagnosis, measurement, and adjustments of SAI, setback, toe, turning radius, steering linkage height and steering wheel centering procedures.
9. Theory, difference, and adjustment on thrust, geometric centerline, total four wheel, and computer alignments.

NARS ATTRIBUTES: 9, 12, 13,14,15,16

Contents

Topics include: components and functions of various types of suspension and steering systems, suspension systems diagnosis and repair, steering systems diagnosis and repair; wheel alignment diagnosis and adjustment. Topics are extended to cover technology of active shock absorbers and benefits in regards of Ride and Handling. Active front steering for passenger cars, new electrical power steering systems, steer-by-wire, potential, and challenges

Text: Automotive Technology, Principles, Diagnosis, and Service. 4th Edition by James D. Halderman.



AUT 324	Vehicle Dynamics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

In this course, students learn about the fundamental theory of vehicle dynamics, vehicle performance as well as related tests and regulations. It is also an important goal to instruct them in the application of the dynamic modeling and analysis approach in vehicle design.

Practical & Professional Skills

- introduce the fundamentals of vehicle dynamics and the performance indices and evaluation criteria of vehicles,
- analyze the influence of vehicle configuration and design parameters on vehicle performance,
- Discuss the approach for predicting vehicle performance and to simulate and analyze vehicle performance as well.
- train the students as specialists in the vehicle engineering domain,
- develop their capacities of analysis, evaluation and design based on their acquisition of skills in modeling dynamic equation and performance analysis

NARS ATTRIBUTES: 9,11,12,13,14,15,16

Contents

1. Computer Modeling and Analysis: introduction and comparison of some purpose-designed simulation codes, multi-body system dynamics packages and toolkit; mainly focusing on MATLAB/Simulink software;
2. suspension control system design
3. 4WS : introduction to simple Modelling, simulation, and performance comparison with conventional systems
4. Vehicle control systems and the integration technique, TCS and ESP(VSC);

Text:

Fundamentals of Vehicle Dynamics by Gillespie



AUT 325	Automotive Transmission systems	Lecture : 2	Tutorial: 0	Lab: 3
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Specific Goals:

The course introduces theory, components and functions, diagnosis, repair and service of, manual and automatic transmissions. Emphasizes are placed to modern technologies applied to recent vehicles.

Practical & Professional Skills

- Explain the development, operational aspects and design principles of passenger vehicle and light truck transmission systems, their major components and sub-systems
- Describe the operational parameters and inter-relationships of each of the sub-systems
- Apply diagnostic and analysis techniques for faults of each of the major components and sub-systems
- Compare and contrast 'stepless' to 'stepped' transmission technology
- Use measuring tools and equipment to carry out repair work of transmission systems
- Recognize the limitations, technological trends, and potential new products under consideration
- Summarize the direction of new passenger car transmission designs and systems

NARS ATTRIBUTES: 9,11,12,13,14,15,16

Theory, components and functions, diagnosis, repair and service of clutches, manual transmissions, manual transaxles, drive shafts, drive axles, four-wheel drive systems, all-wheel drive systems, and electrical systems while incorporating standard safety procedures. Automatic transmission hydraulic/mechanical theory, automatic transmission service, and exterior adjustments

Text:

Automotive Transmissions Fundamentals, Selection, Design and Application, Authors: Naunheimer, H., Bertsche, B., Ryborz, J., Novak, W.



AUT 326	Braking Systems	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

The course introduces brake systems theory and its application to automotive systems including ABS. The course is designed to enable student to understand concepts of system operations, performance parameters, fault diagnosis and repair work. The course also introduces the calculating, measuring and analysis of braking force on each wheel as a requirement for designing parts.

Practical & Professional Skills (Lab/ workshop work)

- Develop understanding of automotive braking theory, operations, nomenclature, and safe use of equipment.
- Perform special test for diagnosis of hydraulic brake systems.
- Explain operations of metering and proportioning valve assemblies.
- Preparation, inspection, service, and replacement of complete disc and drum brake systems
- Identify, diagnose, explain, and service hydraulic and vacuum operated brake power assist units.
- Identify, diagnose, explain, and service operations on a variety of anti-lock brake systems.
- Identify, diagnose, service, and repair of parking brake systems.
- Develop an understanding of the electrical operations used in conjunction with the automotive braking systems.

NARS ATTRIBUTES: 9, 12, 13,14,15,16

Contents

Fundamentals of braking systems: components and functions, hydraulic control devices; system service; power brakes; calculation of braking forces, braking system performance parameters; brake problems and diagnosis; brake service philosophy; and legal and health issues. Tests: measuring of braking forces, stopping distance, deceleration. Anti-Lock braking Systems, theory of operation, components and functions, Faults and diagnosis, repair work.

TEXT:

Textbook and Other Materials: Automotive Technology, Principles, Diagnosis, and Service. 4th Edition by James D. Halderman

AUT 327	Electric Vehicles	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:



This course covers electric vehicle engineering concepts, theory, and applications to cope with rapid technology in electric passenger car industry.

Practical & Professional Skills

Upon completion of the course, students will be able to:

- Define and analyze fundamental electrochemistry of battery operation and performance requirements for full electric vehicle applications
- Estimate the size of a cell to meet a specific requirement
- Create a cradle-to-grave, or cradle-to-use list of materials used in any type of automotive battery
- Compute the temperature response of battery cell and pack assemblies for a simple model
- Describe the functions performed by a Battery Management System (BMS)
- Explain different approaches to estimating state of charge, state of health, power and energy
- Apply the operation of brushless dc and induction motors to EV vehicles
- Define the torque speed curves for motors and the application to electric and vehicles
- Describe the features of buck, boost, and Transformer converters
- Describe the main electric vehicle development considerations and performance requirements for various vehicle system
- Identify how to define key vehicle system requirements and select and size system components that best meet those requirements

NARS ATTRIBUTES: 11, 12,13,15,16

Contents

- Overview of Electric Vehicles
- Electric Vehicle Powertrain
- EV Powertrain Configurations: EV Powertrain Parameters- EV Auxiliaries
- Energy Sources: Batteries- Power and Energy Requirements for Electric Vehicles- Rechargeable Battery Basics- Advanced Batteries for Vehicle Applications- Batteries Indication and Management- Battery Safety for Lithium Batteries in Vehicle Applications
- Traction Motor Drives: General Requirement of Traction Motor Drives- DC Motor Drives- Induction Motor Drives- Permanent Magnet Machines for Traction Applications- Powertrain Control and Energy Regenerative Braking Systems
- Battery Management Systems
- Battery Charging Standards
- Communication of Electric Vehicles
- Voltage Control and Frequency Control
- Impact of Electric Vehicles on Low Voltage Supply Systems

Tutorial/ Lab:

- Battery Management Systems
 - Block Diagram - Main Functions of a BMS

- Sensing Requirements
 - Cell/module level: cell voltage, cell/module temperature, (humidity, smoke, air/fluid flow)
 - Pack level: current, pre-charge temperature, bus voltage, pack voltage, isolation
- Control Requirements
 - Contactor control, pre-charge circuitry
 - Thermal system control
- Cell Balancing: Active versus passive, strategies
- Estimation Requirements
 - Strategies: different approaches and benefits of model-based approach
 - How to create a model via cell tests
 - State of Charge estimation
 - State of Health estimation
 - Power estimation
 - Energy estimation (range estimation)
- Electronics Topologies
 - Monolithic versus master/slave versus daisy-chain
 - Implications of battery pack topologies: parallel strings versus series modules
 - Available chipsets for designing electronics
- Other Requirements: CAN communication, data logging, PH/EV charger control, failure modes/detection, thermal systems control
- Future Directions for Battery Management, Degradation Control
- Battery Charging Standards
 - Overcharge Reactions
 - Consequences of Overcharge
 - Design Considerations
 - Thermal Considerations
 - Charging Infrastructure/methods
 - Conductive Charging
 - Method
 - Standards
 - Inductive Charging
 - DC Charging
 - Definition
 - Issues: Infrastructure, Thermal, and Life
 - Grid Infrastructure
 - Basic infrastructure
 - Grid interactions: bi-directional communication and power flow
- Aspects of Battery Pack Design
- Traction motors.
 - Modelling and Control
 - Performance parameters

TEXT: Electric and Hybrid Vehicles, 1st Edition, Gianfranco Pistoia



AUT420A	Intelligent Control Systems	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is designed to cover the 4 main areas of Intelligent Control Systems including: Intelligent Modeling, Optimization methods, Intelligent Control Strategies, and Multivariate Systems and Applications. Emphasizes are placed on practical applications related to electrical engineering industries.

Practical & Professional Skills (Lab/ workshop work)

Upon completion of the subject, students will be able to:

1. Learn the unified and exact mathematical basis as well as the general principles of various soft computing techniques.
2. Provide detailed theoretical and practical aspects of intelligent modeling, optimization and control of non-linear systems.
3. Develop intelligent systems through case studies, simulation examples and experimental results.

In relation to NARS (The Attributes of the Engineers, section 1.2)

- Apply Knowledge of math, science and engineering
- Identify, formulate, and solve engineering problems
- Use techniques, skills, modern engineering tools

Students are required to carry out programming as part of the project using either matlab or C or C++.

Contents:

Principles of intelligent system - Fuzzy control - neural control - genetic algorithms - learning control - distributed intelligent control

TEXTS:

Y.C. Shin and C. Xu, Intelligent Systems: Modeling, Optimization and Control, CRC Press, 2008.



AUT 420B ENG 316	Energy Storage Systems	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course covers all types of currently-available energy storage systems, the fundamental principles of energy storage technologies, the main economics aspects of each technology and a case study analysis of a particular project. The various technologies discussed are categorized in conventional energy applications and recent new and renewable energy applications.

Practical & Professional Skills

At the end of the course, students will:

- Have a clear understanding of the need and the nature of the storage required in operating renewable energy systems
- Have a clear understanding of the different storage technologies currently in wide use within sustainable systems
- Can analyze and design a sustainable energy system with associated storage and assess its economics and technical operation

NARS ATTRIBUTES :9,10,11,12,13

Contents

Introduction to energy storage systems - Physical storage media: Compressed air, Electrochemical cells – hydrogen – Batteries: Lead acid, Ni-metal hydride, Lithium ion – Fuel cell: Polymer electrolyte membrane, Alkaline, Phosphoric acid, Molten carbonate, Solid oxide, and Regenerative - Fuel cell applications: Transport, Combined Heat and Power – Super capacitors – Small scale storage systems: flywheels and springs – hydraulic and pneumatic accumulators – continuous and standby uninterruptible power supplies – Large scale storage solutions: hydro pump, compressed air, underground gas reservoirs – Energy storage economics – Environmental implications of energy storage.

TEXT:

Energy Storage Fundamentals, Materials and Applications. Authors: **Huggins**, Robert

AUT 420C ENG 420C	Combustion Technology	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

The aim of this course is to provide students with the required fundamental knowledge in laminar and turbulent combustion. The laminar combustion topic will mainly be on flame theory, including premixed and diffusion flame structure as well as flammability limits. The turbulent combustion part will cover the different regimes in premixed combustion including a COM on expression for the turbulent burning velocity, as well as the flamelet concept and its applications for non-premixed turbulent combustion.

In relation to NARS (The Attributes of the Engineers, 2009)
9,10,11

Contents

The basic principles of combustion highlighting the role of chemical kinetics, fluid mechanics, and molecular transport in determining the structure of flames - laminar and turbulent combustion of gaseous and liquid fuels including the formation of pollutants - Equilibrium compositions, flammability limits, simple chemically reacting systems, detailed chemical kinetics, and the basic theory underlying laminar and turbulent combustion for both premixed and non-premixed cases- droplet combustion - the concept of mixture fraction for non-premixed flames – Combustion aerodynamics – Combustion emissions control system – Design of burners and its control systems – Furnace design.

TEXT: Combustion, Fourth Edition 4th Edition, by Irvin Glassman and Richard A. Yetter

AUT 420D ENG 420D	Quality Control	Lecture : 2	Tutorial: 2	Lab: 0
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3- Contents

Design of quality control systems; quality methods for establishing product specifications; process control; variables and attributes charts; acceptance sampling; operating characteristics curves; process capabilities; QC software

In relation to NARS (The Attributes of the Engineers, 2009)
9,10,11

AUT 421	Computerized Engine Control systems	Lecture : 2	Tutorial: 0	Lab: 4
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Specific Goals:

The course introduces concept of electronic engine control including OBD I and OBD II.

Practical & Professional Skills

- Explain the purpose, function and operation of "flash" codes
- Describe the diagnostic procedures and routines relating to a trouble code.
- Explain the purpose and operation of a scan tool.
- Describe the differences between OBD I and OBD II.
- Describe how the powertrain control module performs active and passive tests of the computerized engine control system.
- Describe the standardized OBD II DTCs and terminology.
- Explain the purpose behind one- and two-trip logic
- Check Engine Light Operation
- Carryout full analysis of Live Computer Data
- determine operating condition of the vehicle's emission control system
- test emission control systems, record the results, and display those results
- monitor ALL OBD II information and the Test Results
- Carry out repair work and parts replacement

NARS ATTRIBUTES: 11, 12, 13,14,15,16

Contents

The course introduces concept of electronic engine control including various sensors types and functions, actuators types and functions and control strategies. On-Board Diagnostics I, and II (OBD), requirements, monitoring theory and technology, diagnostic trouble code definitions, essentials of drivability diagnosis, and data interpretation using a scanner.

TEXT:

OBD-II & Electronic Engine Management Systems, Haynes, ISBN-13: 860-1401374770

AUT 422	Chassis Design	Lecture :2	Tutorial: 3	Lab: 0
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Specific Goals:

The underlying objective of this course is to learn how to quantitatively and qualitatively design common mechanical elements such as gears, shafts, bearings and fasteners. Having achieved these, the student will learn how to design a complete set of automotive transmission, driveline and gear box, and vehicle frame.

Practical & Professional Skills

- Define fatigue failure and its underlying mechanisms, and contrast to static failure



- Apply appropriate advanced static failure theories to predict part failure under general loading
- Analyze parts under general loading to predict fatigue failure
- Qualitatively identify fatigue failure progression from fracture surface inspection
- Comment on key aspects of gearbox layout diagrams
- Design gearbox housings for assemble-ability
- Specify appropriate couplers for transmission connections
- Perform detailed design of shafting including locating features
- Identify spur, helical, bevel and worm gear variants
- Specify pinion-gear and epicyclical/planetary arrangements and speeds to satisfy given gearbox functionality requirements (speed, power, size)
- Design spur and helical gear teeth for a given set of transmission specifications
- Select and analyze rolling element bearings suitable for a given application, including locating and non-locating functionality
- Specify required fasteners and torque specifications to guard against axial and shear failure and joint separation
- Design weld details for given static and fatigue loading
- Design the vehicle frame
- Design a complete set of an automotive clutch, torque convertor and gearbox
- Recognize the environmental impact of mechanical design decisions

NARS ATTRIBUTES: 11, 12, 13,14,15,16

Contents (Lectures + Tutorial)

- Transmission and Driveline: Gear and Components - Transmission Gear Design - Bearings and Bearing Design for Transmissions- Mechanics of Contacting Surfaces -Tribological Optimization in the Powertrain - Synchronizers—Gear Change Process, Loads, Timing, Shift Effort, Thermal Loads, Materials and Tolerances - Dry and wet Clutch Design and Gearbox Design - Automotive Torque Converters Design - Frame Design

TEXT: Machine Design: An Integrated Approach, 5/E, Norton, R. L., Prentice Hall, 2014

AUT 423	Fuel Injection and Electronic Ignition Systems	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course covers conventional and electronic ignition system, fuel systems and emission control, computer sensor systems. Emphasizes are placed on systems' components and functions, diagnosis of faults using modern automotive equipment.

Practical & Professional Skills (Lab/ workshop work)

- Demonstrate knowledge and understanding of electronic ignition systems



- Demonstrate knowledge and understanding of engine fuel injection systems, both mechanical and electronic
- Demonstrate procedures necessary in servicing electronic engine ignition systems
- Demonstrate procedures necessary in servicing fuel injection systems.
- Apply electrical knowledge to engine performance sensors and the modules that control them
- Interpret scan tool data to diagnose engine performance problems

NARS ATTRIBUTES: 9,11,12,13,14,15,16

Contents

Ignition System: types, components and function. Ignition System Diagnosis and Repair. Fuel injections systems: types, components and function. Fuel Systems and Emission Control Diagnosis and Repair. Computer Sensor Testing and Diagnosis

Lab:

Students will be able to diagnose and repair a vehicle with a no-start condition resulting from a fuel or ignition problem. The student will be able to access vehicle computer information, including inputs, outputs, and miscellaneous test. Practice work includes:

- Introduction to manual usage: Manufacturer's manuals- .Aftermarket manuals
 - Simulate no start use of service manuals/CD Rom to diagnose
 - Ignition service safety. Identification and testing of system components
 - Primary/Secondary circuit testing and service
 - Timing and test adjustment with electronic controls, Ignition Timing, Component location, Distributor removal and reinstallation, Breaker point and solid state overhaul procedures, Static timing
 - Electronic Engine Control: Troubleshooting principles, Electronic system service procedures (testing inputs with DVOM), Self-diagnostic systems, Manufacturer-specific systems testing, Automatic system testers (scanners)
 - Performance Testing: Live skills performance oriented test
-
- Fuel Delivery Systems: Fuel injection systems orientation, Fuel pump testing-pressure/volume, Fuel injector balance and resistance, Testing fuel pump current draw, Computer Scanning, Inputs and outputs (different scan tools)
 - Miscellaneous tests, Oxygen sensor diagnostics, Compression Testing, Cylinder Leakage, Compression testing - wet/dry, Use of Snap-On Leak Detector
 - Problem Analysis

TEXT:

Automotive Technology: A Systems Approach, AUTHOR: Jack Erjavec, ISBN-13: 9781401848316

AUT 425	Hybrid, and Fuel Cell Vehicles	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course covers electric vehicle engineering concepts, theory, and applications to cope with rapid technology in electric passenger car industry.

Practical & Professional Skills

- Define and analyze fundamental electrochemistry of battery operation and performance requirements for HEV, PHEV, EREV vehicle applications
- Estimate the size of a cell to meet a specific requirement
- Apply the operation of brushless dc and induction motors to HEV vehicles
- Define the torque speed curves for motors and the application to hybrid electric vehicles
- Compare and contrast the various industry and regulatory standards for hybrid Describe the main hybrid vehicle development considerations and performance requirements for various vehicle system
- Identify how to define key vehicle system requirements and select and size system components that best meet those requirements
- Evaluate the Traction Characteristics for HV
- Evaluate the running cost of HV

NARS ATTRIBUTES: 11, 12, 13,14,15,16

Contents

- Overview of Hybrid, and Fuel Cell Vehicles
- Hybrid Electric Vehicle Powertrain: Basic Consideration
- Micro, Mild, and Full Hybrids
- Series Hybrid Electric Vehicles (SHEVs)
- Parallel Hybrid Electric Vehicles (Parallel HEVs)
- Series-Parallel Hybrid Electric Vehicles
- All-Wheel Drive Hybrid System
- EVT and E-CVT for Full Hybrid Electric Vehicles
- Power and Energy Requirements for Hybrid Vehicles
- Fuel Cell Powered Vehicles
- Ultra-capacitors in Hybrid and Plug-in Electric Vehicles
- Energy Management System of HEVs

TEXT:

Electric and Hybrid Vehicles, 1st Edition, Gianfranco Pistoia.

AUT 426	Chassis Control systems	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:



This course introduces the student to the up to date technology in controlling vehicle stability during various modes of operations. Emphasizes are placed on system components, theory of operation and diagnosis and repair of faults stored in the vehicle's computer.

Practical & Professional Skills(Lab/ workshop work)

- Possess relevant knowledge on chassis control
- Understand the principles of speed and stability control including traction, slip and yaw motion control systems
- Inspect fault diagnosis and analysis on the performance of vehicle control systems
- Apply Professional practice on solving of vehicle stability problem
- Replace parts of chassis control systems
- Carry out post-repair testing according to workplace procedures and relevant legislation

NARS ATTRIBUTES: 11, 12, 13,14,15,16

Contents

The Potential for Handling Improvements by Global Chassis Control. Customer-Oriented Evaluation of Vehicle Handling Characteristics. Global Chassis Control in Passenger Cars. Chassis Control Systems: Electronic stability program, traction and slip control, various components and functions including sensors, actuators and theory of operation. Interaction between various control systems using computer management system. The use of scan tools to diagnose systems faults. Automated Driving

TEXT:

1. Handbook of Automotive Engineering, Society of Automotive Engineers International, latest edition.

AUT 427	Automotive Intelligent Systems	Lecture : 2	Tutorial: 0	Lab: 4
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Specific Goals:

The course introduces the theory, operation, maintenance, diagnosis and repair work of automotive heating, ventilation and air conditioning systems, heated glass, mirror, and seat systems, electrical windows systems, supplemental restraint systems, cruise control systems, anti-theft systems, and radio systems. Goals are extended to cover recent technology systems including Wireless LAN-Based Vehicular Communication, Positioning GNSS, Tracking and Navigation for Goods and People

Practical & Professional Skills

- Possess relevant knowledge on Automotive Intelligent Systems
- Inspect fault diagnosis and analysis on the performance of Automotive Intelligent Systems
- Apply Professional practice on solving of vehicle intelligent systems problems



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- Replace parts of Automotive Intelligent Systems
- Carry out post-repair testing according to workplace procedures and relevant legislation
- Understand the principles Wireless LAN-Based Vehicular Communication, Positioning GNSS, Tracking and Navigation for Goods and People

NARS ATTRIBUTES: 11, 12, 13,14,15,16

Contents

Basic principles of refrigeration/heating/air management and controls; climate control operation; and climate control diagnosis and service- Diagnose, service and repair of advanced electronic wiper/washer systems, heated glass, mirror, and seat systems, electrical windows systems, cruise control systems, anti-theft systems, and radio systems. Wireless LAN-Based Vehicular, Positioning GNSS and Tracking and Navigation for Goods and People

Lab Work: inspect, diagnose and repair of automotive intelligent systems listed above in the contents.

TEXT:

Handbook of Automotive Engineering, Society of Automotive Engineers, International, latest edition.



AUT 499	Capstone Project	Lecture : 1	Tutorial: 0	Lab: 6
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Specific Goals:

To provide students with a holistic understanding on various automobile engineering systems, including the chassis, power train and transmission, suspension and steering, braking through practical appreciation and participation in designing, developing and building up a concept car

Practical & Professional Skills(Lab/ workshop work)

1. Understand automotive structures and sub-systems;
2. Design and develop and build up a concept car
3. Work practically on car design and manufacturing process.
4. Have advanced and internationally recognized skills and in-depth technical competence necessary for a successful career in Automotive Engineering.
5. Are familiar with current best practice in the automotive engineering.
6. Are capable to work as a mechanical engineer in general, and as a manufacturing or design engineer in the areas of automotive engineering.
7. Possess the necessary skills to analyze and investigate the mechanical and electrical systems applied in automotive engineering
8. Have the skills to work as a production line or service engineer in the automotive

NARS ATTRIBUTES: 11, 12, 13,14,15,16Contents (Lect + Lab)

Appreciation of the construction and design of major automobile components, including Chassis and body: including ladder type, integral and semi integral.

TEXT:

1. Handbook of Automotive Engineering, Society of Automotive Engineers International, latest edition.
2. Birch T.W., Automatic Transmissions and Transaxles, Prentice Hall, latest edition.
3. Dixon J.C., Tires, Suspension, and Handling, Society of Automotive Engineers International, latest edition.
4. Erjavec J., Hybrid, Electric, and Fuel-Cell Vehicles, Cengage Learning, latest edition.
5. Knowles D., Automotive Suspension & Steering Systems, Cengage Learning, latest edition.
6. Macey S., H-Point: The Fundamentals of Car Design & Packaging, Design Studio Press, latest edition.
7. Milliken W.F., Milliken D.L. and Olley M., Chassis Design: Principles and Analysis, Society of Automotive Engineers International, latest edition.
8. Sclar D., AUT Repair for Dummies, For Dummies, latest edition.
9. Walker J., High-Performance Brake Systems, CarTech Inc., latest edition.



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Communication Engineering Program Specification

Communication Engineering Programm Specification

1 Program Educational Objectives

A. Department Mission Statement



The Department's mission is to provide all students with opportunities to address complex and multi-faceted communication engineering problems. The Department provides students with the fundamentals necessary to evolve in the profession and to respond to changing technological and societal needs. In addition, the Department's program provides the depth of preparation and fosters intellectual curiosity needed for graduate studies and research in communication engineering.

B. Program Educational Objectives

The Program is designed such a way the student can choose his specialization in the area of communication Engineering

Following graduation our students are expected to:

- Successfully apply fundamental mathematical, scientific, and engineering principles in formulating and solving engineering problems;
- Work competently in electrical engineering areas of practice;
- Work effectively and conduct themselves ethically in their professional environment;
- Develop improved skills and new skills to enhance the state of their practice in a dynamic professional environment.

2. STUDENT OUTCOMES

A. Student Outcomes

We have adopted the National Academic Reference Standards (NARS) as our own Program Outcomes. In order to develop improved skills and new skills to enhance the state of their practice in electrical engineering, students must be able to: apply knowledge of mathematics, science, and engineering; understand the impact of engineering solutions in a global, economic, environmental, and societal context; have knowledge of contemporary issues; recognize the need for, and be able to engage in life-long learning; use the techniques, skills, and modern engineering tools necessary for engineering practice; and explain basic concepts in management, business, public policy, and leadership.

It is also expected that students will need to spend additional time practicing skills in a work environment and in completing projects and assignments, in order to fulfil Training Package assessment requirements. Work placement is a mandatory requirement within this Framework and appropriate hours have been assigned to each course.

Learning in the workplace will enable students to:

- progress towards the achievement of industry competencies
- develop appropriate attitudes towards work
- learn a range of behaviors appropriate to the industry
- practice skills acquired in the classroom or workshop
- develop additional skills and knowledge

The graduates of the engineering programs should be able to: (NARS 2009)



- 1- Apply knowledge of mathematics, science and engineering concepts to the solution of engineering problems
- 2- Design a system; component and process to meet the required needs within realistic constraints.
- 3- Design and conduct experiments as well as analyze and interpret data.
- 4- Identify, formulate and solve fundamental engineering problems.
- 5- Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.
- 6- Work effectively within multi-disciplinary teams.
- 7- Communicate effectively.
- 8- Consider the impacts of engineering solutions on society & environment.
- 9- Demonstrate knowledge of contemporary engineering issues.
- 10- Display professional and ethical responsibilities; and contextual understanding
- 11- Engage in self- and life- long learning
- 12- Have advanced and internationally recognized skills and in-depth technical competence necessary for a successful career in Communication and Electronic Engineering.
- 13- Are familiar with current best practice in the communication and electronic engineering.
- 14- Are capable to work as a Communication engineer in general, and as a manufacturing or design engineer in the areas of Communication and electronicsystem equipment's .
- 15- Have the skills to work as a production line or service engineer in the Communication and electronic areas.
- 16- Design, operate and maintain digital and analog communication, mobile communication, coding, and decoding systems
- 17- Planning and analyzing new communication and telecommunication networks

3 Curriculum Description

The curricular structure is aimed to be consistent with the PEOs as follows:

- i. It provides ample opportunities in each of the nominal five years of study to ensure students can successfully apply fundamental mathematical, scientific, and engineering principles in formulating and solving engineering problems.
- ii. It ensures that graduates will be prepared to work competently in multiple core areas of electrical engineering specifically in Communication Engineering



- iii. The multiple opportunities for group work culminating in the capstone design sequence lays the groundwork for graduates to work effectively and conduct themselves ethically in the professional environment.
- iv. The balance of fundamentals and practice in the curriculum ensures graduates will be capable of furthering their education both formally and informally, and the general experience of being instructed by research-active faculty can implicitly inculcate graduates with the understanding of ongoing development and mastery of new knowledge.

4 Graduation Requirements

In order to achieve a Bachelor Degree in Electrical Engineering, a student must fulfill the following NARS requirements:

In order to achieve a Bachelor Degree in Automotive Engineering, a student must fulfill the following NARS requirements:

List of these Courses are as follows:

Humanities and Social Sciences	8.3 %
Basic Science Courses	19.66 %
Basic Engineering Science Courses	29.33 %
Application and Design Courses	29.3 %
Engineering Culture	4 %
Business Administration	2.66 %
Projects and Practice	% 6

A. List of Humanities and Social Science Courses (625 Marks) 8.3%

HUM 051	English Language I	75
HUM 052	English Language II	75
HUM 053	Human Rights	75
HUM 054	Health, safety and Risk Assessment	75
HUM 151	Technical Writing	100
HUM 352	Foundations of Management	75
HUM 353	Macroeconomics	75
HUM 451	Critical Thinking	75



B. List of Basic Science and Mathematics Courses (1475 Marks) 19.6%

BAS 021	Engineering Statics	125
BAS 022	Calculus	125
BAS 023	Linear Algebra	125
BAS 031	Physics I	125
BAS 032	Physics II	125
BAS 041	General Chemistry	100
BAS 042	Engineering Chemistry	125
BAS 121	Calculus in Several Variables	125
BAS 122	Kinematics and Dynamics	125
BAS 123	Ordinary Differential Equations	125
BAS 124	Probability and Statistics	125
BAS 131	Engineering Physics	125

C. List of Basic Engineering Science Courses (2200 Marks) 28.33%

AUT 011	Engineering Drawing	125
AUT 012	Production Technology & Workshops	125
COM 111	Logic Circuits	125
COM 112	DC Circuit Analysis	125
COM 113	Communication principles	125
COM 211	Circuit Theory Application	125
COM 212	Electronics Principles I	125
COM 213	Measurements and Control Elements	125
COM 215	Electronic circuits	125
COM 216	Automatic Control	125
COM 223	Engineering Electromagnetics 1	125



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COM 311	Electrical Machines	100
COM 234	Computational Techniques in Communication Eng.	125

Computer Applications Courses

COM 131	Introduction to Programming	100
COM 132	Graphics and Computer-Aided Drawing	100
COM 133	Programming I	100
COM 231	Algorithms and Data Structures I	100
COM 232	MATLAB	100
COM 235	Computer organization	100

D. Technical Core Courses in Communication Engineering (2225 Marks) 29.33%

COM 224	Engineering Electromagnetics 2	125
COM 320x	Elective Course 1	125
COM 320x	Elective Course 2	125
COM 321	Microwave Electronics	125
COM 322	Signals and Systems Analysis	125
COM 323	Power electronics	100
COM 324	Satellite communication	125
COM 325	Introduction to Microprocessors	125
COM 326	Mobile communication systems	125
COM 420x	Elective Course 3	125
COM 420x	Elective Course 4	125
COM 421	Digital Signal Processing	125
COM 422	Digital communications	125
COM 423	Wave Propagation and Antennas	125
COM 424	Communication networks	125
COM 425	Microwave Engineering	125
COM 426	Error Correcting Coding for Communication Systems	125
COM 427	Optical communications	125

E. Engineering culture BAS x7x (300 Marks) 4%

BAS 171	Environmental Management	100
BAS 371	Engineering Management	100
BAS 372	Operation Researches	100

F. Business Administration BAS x8x (200 Marks) 2.66%

BAS 281	Project Management	100
BAS 081	Fundamentals of Marketing	100



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G. Project & Training. (475 Marks) 6 %

COM 299	Internship 1	100
COM 399	Internship 2	75
COM 499	Capstone Project	300

Study Plan

Communication Engineering Preparatory year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 011	Engineering Drawing	1	4	-	5	50	-	-	75	125	4
BAS 021	Engineering Statics	2	2	-	4	50	-	-	75	125	3
BAS 023	Linear Algebra	2	2	-	4	50	-	-	75	125	3
BAS 031	Physics I	2	-	2	4	25	-	25	75	125	3
BAS 041	General Chemistry	2	-	2	4	20	-	20	60	100	3



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HUM 051	English Language I	2	-	2	4	15	15	-	45	75	2
HUM 053	Human Rights	2	-	-	2	25	-	-	50	75	2
Total		13	8	6	27					750	

Communication Engineering Preparatory year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 012	Production Technology & Workshops	2		4	6	25	-	25	75	125	3
BAS 022	Calculus	2	2	-	4	50	-	-	75	125	3
BAS 032	Physics II	2	-	2	4	25	-	25	75	125	3
BAS 042	Engineering Chemistry	2	-	2	4	25	-	25	75	125	3
BAS 081	Fundamentals of Marketing	2	1	-	3	30			70	100	3
HUM 052	English Language II	2	-	2	4	15		15	45	75	2
HUM 054	Health, Safety and Risk Assessment	2	1		3	25	-	-	50	75	2
Total		14	4	10	28					750	

Communication Engineering 1st Year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
BAS 121	Calculus in Several Variables	2	2	-	4	50	-	-	75	125	3
BAS 122	Kinematics and Dynamics	2	2	-	4	50	-	-	75	125	3
BAS 131	Engineering Physics	2	2	-	4	50	-	-	75	125	3
COM 111	Logic Circuits	2	2	-	4	50	-		75	125	3



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COM 131	Introduction to Programming	2	-	2	4	20	-	20	60	100	3
COM 132	Graphics and Computer-Aided Drawing	2	-	4	6	20	-	20	60	100	3
Total		12	8	6	26					700	

Communication Engineering 1st Year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
COM 113	Communication Principles	2	2	-	4	50	-	-	75	125	3
BAS 123	Ordinary Differential Equations	2	2	-	4	50	-	-	75	125	3
BAS 124	Probability and Statistics	2	2	-	4	50	-	-	75	125	3
BAS 171	Environmental management	2	1		3	40			60	100	3
COM 112	DC Circuit Analysis	2	2	2	6	25	-	25	75	125	3
COM 133	Programming I	2	-	2	4	20	-	20	60	100	3
HUM 151	Technical Writing	2	-	1	3	20	-	20	60	100	2
Total		14	9	5	28					800	

Communication Engineering- 2nd Year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
COM 216	Automatic Control	2	2		4	50			75	125	3
BAS 281	Project Management	2		2	4	40			60	100	3
COM 212	Electronics Principles I	2	1	2	5	25	-	25	75	125	3
COM 223	Engineering Electromagnetics 1	2	2	2	6	20	-	20	85	125	3
COM 231	Algorithms and Data Structures I	2	-	2	4	20	-	20	60	100	3
COM 234	Computational Techniques in Communication Eng.	2	-	2	4	25	-	25	75	125	3
Total		12	5	10	27					700	



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Communication Engineering- 2nd Year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
COM 213	Measurements and Control Elements	2	2	2	6	25	-	25	75	125	3
COM 211	Circuit Theory Application	2	2	-	4	50	-	-	75	125	3
COM 235	Computer organizations	2	2	-	4	25	-	-	75	100	3
COM 215	Electronic circuits	2	-	2	4	25	-	25	75	125	3
COM 224	Engineering Electromagnetics 2	2	2	-	4	50	-	-	75	125	3
COM 232	MATLAB	2	-	2	4	20	-	20	60	100	3
COM 299	Internship									100	
Total		12	8	6	26					800	

Communication Engineering- 3rdYear- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
BAS 371	Engineering Management	2	2	-	4	50	-	-		100	2
BAS 372	Operation Researches	2	2	-	4	50			50	100	2
COM 311	Electrical Machines	2	2	-	4	50	-	-	75	100	3
COM 312	Microwave electronics	2	2	-	4	50			75	125	3
COM 320	Elective 1	2	2	-	4	50	-	-	75	125	3
COM 322	Signals and Systems Analysis	2	2	-	4	50	-	-	75	125	3
HUM 352	Foundations of Management	2	-	-	2	25	-	--	50	75	2
Total		14	12		26					750	

Communication Engineering- 3rdYear- 2nd Term

Course	Course Name	C. Hours	Marks Distribution	S.
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Code		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 320	Elective 2	2	2		4	50		-	75	125	3
COM 323	Power Electronics	2	2	-	4	25	-	-	75	100	3
COM 324	Satellite Communication	2	2	-	4	50	-	-	75	125	3
COM 325	Introduction to Microprocessors	2	-	3	4	25	-	25	75	125	3
COM 326	mobile communication systems	2	3		5	50	-		75	125	3
HUM 353	Macroeconomics	2	1	-	3	25	-	-	50	75	2
COM 399	Internship									75	
Total		12	10	3	25					750	

Elective1

COM 320A Electronic design with aids of computer
COM 320B Fundamentals of biomedical engineering

Elective 2

COM 320C Information systems
COM 320D Computer Circuits Design
COM 320E Artificial Intelligence

Communication Engineering- 4th Year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
COM 420	Elective 3	2	2		4	50	-		75	125	3
COM 421	Digital signal processing	2	-	2	4	25	-	25	75	125	3
COM 422	Digital Communications	2	2	2	6	25		25	75	125	3
COM 423	Wave Propagation and Antennas	2	2	-	4	50	-	-	75	125	3
COM 424	Communication networks	2	-	2	4	25		25	75	125	3
COM 499	Capstone Project	1	-	5	6	Continuous				-	-
Total		11	6	11	28					625	

Communication Engineering- 4th Year- 2nd Term

Lab	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral		Written	Total	



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COM 420	Elective 4	2	2	-	4	50	-		75	125	3
COM 425	Microwave Engineering	2	2	-	4	50	-	-	75	125	3
COM 426	Error Correcting Coding for Communication Systems	2	2	-	4	50	-	-	75	125	3
COM 427	Optical Communications	2	2	-	4	50	-		75	125	3
COM 499	Capstone Project	1	-	6	7	150	150	-	-	300	-
HUM 451	Critical Thinking	2	-	-	2	25	-	-	50	75	2
Total		11	8	6	25				875		

Elective

Elective course 3

COM 420A **Robotics engineering**

COM 420B Radar Systems

Elective course 4

COM 420C Neural networks

COM 420D Introduction to VLSI Design



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Communication Engineering

Course Description

Basic Engineering Science Courses

Specific Goals:

AUT 011	Engineering Drawing	Lecture : 1	Tutorial: 4	Lab: 0
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- Understand working drawings in ISO standards together with any written instruction.
- Knowledge of standards for conventional dimensioning and tolerancing, and geometric dimensioning and tolerancing appropriate to the ISO standards.
- Understand the rules of technical drawing and the prevailing latest ISO standards that govern those rules
- Using the manuals, tables, lists of standards and product catalogues

Learning Outcomes

1. Use various drawing instruments
2. Define Bases for interpreting Drawings
3. Sketching Missing Views
4. Sketching Three Views
5. Sketching Pictorial Views
6. Writing Dimensioning on Drawings
7. Matching Drawings
8. Using Abbreviations on Drawings
9. Sketching Circular Features
10. Sketching Inclined Surfaces Features
11. Writing Dimensions on Cylindrical Holes
12. Sketching Full Sections
13. Sketching Half Sections

NARS ATTRIBUTES: 1, 2, 5

Contents:

- Drawing Instruments
- Lettering
- Geometric Construction
- Freehand Sketching
- Orthographic Projection with Instruments
- Primary Auxiliary Views
- Sections
- Dimensioning
- Tolerances
- Working Drawings

TEXTBOOKS:

- Engineering Design Graphics: Sketching, Modeling, and Visualization, by James Leake and Jacob Borgerson



AUT 012	Production Technology & Workshops	Lecture : 2	Tutorial: 0	Lab: 4
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Specific Goals including practices in workshop

- To introduce students to the role of manufacturing in an economy and to show the relationship between design and manufacturing.
- To make students aware of the necessity to manage manufacturing processes and systems for the best use of material and human resources with particular emphasis on product safety and environmental considerations
- To introduce students to the scientific principles underlying material behavior during manufacturing processes
- To build up practical skills necessary to perform basic concepts of manufacturing via shaping, forming, machining, and assembly
- To develop a knowledge of appropriate parameters to be used for various machining operations
- To develop a knowledge of workshop practice and basic use of machine tools and workshop equipment.

NARS ATTRIBUTES: 1, 4, 6

LEARNING OUTCOMES

On successful completion of this course, students should be able to:

- Analyze various machining processes and calculate relevant quantities
- Have a basic knowledge of safe workshop practice and the environmental implications of machining process decisions
- Identify and explain the function of the basic components of a machine tool
- Understand the limitations of various machining processes with regard to shape formation and surface quality and the impact this has on design
- Understand the procedures and techniques involved for the manufacturing of components, and keep up to date with innovation through literature search.
- Carry out simple machining operations based on machining drawings

Contents:

Introduction to Engineering materials – Metallic and non-metallic materials – cast iron and steel furnaces – metal casting – metal forming – extrusion – bending – welding – turning – milling – shaping – drilling – simple measurement tools – production quality – practical hand skills in the workshop- introduction to industrial safety.

TEXT:

A Textbook of Workshop Technology: Manufacturing Processes, S. Chand Limited, Jan 1, 2008



COM 111	Logic Circuits	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course develops skills in the area of Boolean algebra and in the application of this mathematical area to practical digital engineering problems. Specifically the course is designed to bridge the area of Boolean algebra with digital circuits, since students learn to design and debug these circuits using tools and methodologies that are consistent with modern engineering practice (CPLDs and programming tools for them). Students also learn to build simple circuits and to construct more complex designs based hierarchically on these.

Learning Outcomes

The Student will be able:

- Representation of digital information: Number systems
- The basic logical operations: Truth tables

NARS ATTRIBUTES : 1,2,3

Contents

- Boolean algebra-
- Algebraic simplification
- Minterm and maxterm expansions
- Karnaugh maps
- Multi-level gate networks
- Multiple-output logic: Multiplexers, decoders, read-only memories, programmable logic arrays
- Combinational network design
- Flip-flops: Registers and information transfer
- Sequential network analysis and realization
- State tables: Reduction of state tables
- Introduction of asynchronous sequential networks

TEXT: Fundamentals of Logic Design. Roth, Jr./Kinney. 2013.



Specific Goals:

This course introduces students to basic concepts of Electrical Engineering. Critical aspects in the professional education as the strategies to identify and solve technical problems, communication skills, ethics and the capability to work in teams are also addressed during the course.

The Student will be able to:

- use node and mesh analysis, source transformation and linearity to determine node voltage and loop currents
- find Thevenin and Norton Equivalent Circuits
- analyze basic OpAmp circuits
- analyze measurements
- perform of lab and measurement procedures
- write lab reports
- understands role of modeling and simulation

NARS ATTRIBUTES : 1,2,3,4

Contents

Basic concepts: System of units. Charge, current and voltage. Power and energy. Circuit elements

Basic Laws: Ohm's Law. Kirchhoff's Law. Series and parallel resistors.

Analysis: Nodal analysis. Mesh analysis

Circuit Theorems: Linearity. Superposition. Thevenin's theorem. Norton's theorem

Operational amplifiers: Introduction. Ideal Op Amp

Capacitors and inductors: Introductory ideas. Series and parallel capacitors. Series and parallel inductors.

Step response RC/RL circuits- Step response RLC circuits

Lab:

- Introduction to laboratory. Department rules, procedure, policies. Proper way to write a laboratory report. Safety Considerations, nature of voltage, current and resistance..
- Use of meters and the Feedback Kit Experiment
- Ohm's Law.
- Kirchhoff's Law
- Troubleshooting of Series and parallel Circuits. (resistance measurements)
- Troubleshooting of Series and parallel Circuits. (voltage measurements)
- Superposition
- Thevenin's Theorem
- Norton's theorem
- Ideal Op Amp
- RC/RL circuits
- RLC circuits
-

TEXT:

Mario C. Marconi & Stephen V. Milton, Fundamentals of Electric Circuits. Alexander, Charles & Sadiku, Matthew. 2012.



COM 113	Communications Principles	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

The objective is to teach students fundamental concepts of tele communications: different analog and digital communication systems, their application, and susceptibility to noise. Statistical analysis of analog and digital systems in the presence of noise is taught in this course. Course requires students to do a research on a communication system of their choice and submit written report at the end of the semester. During the research, students have to find as much data on the system as possible regarding used signals, their levels, modulation, and resistance to noise; then present findings.

NARS ATTRIBUTES : 1,4,13

Contents

Overview and Basic elements of communication Systems; Transmission through Systems and Channels; Modulation; AM; Frequency Conversion; FM and PM; Superhetrodyne Receiver; FDM; Stereo Broadcasting; Sampling; Pulse Modulation (PAM, PWM, PPM); TDM; Pulse Code Modulation (PCM); DPCM and DM; Regenerative Repeaters; Advantages of Digital communication; Line Coding (Binary Signaling); Introduction to Digital Modulation (ASK, FSK, PSK).

Text:

Textbook: Simon Haykin and Michael Moher, "An Introduction to Digital and Analog communications", John Wiley, 2006



COM 211	Circuit Theory Applications	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

This course provides students with a more in-depth understanding of circuit theory concepts including circuit analysis techniques and applications to engineering design problems. Further developing students strategies to identify and solve technical problems, communication skills, ethics and the capability to work in teams are also addressed in the course.

The Student will be able to:

- Understand operation of first and second order circuits
- derive characteristic equation , determine type of response and find total response of a circuit
- use mesh and node analysis to analyze circuits with independent and dependent sources
- apply superposition, source transformation, Thevenin and Norton theorems
- calculate instantaneous and average power
- understand the difference between maximum and RMS value and apply correct formulas
- understand principles of power factor correction
- use PQS triangle
- know configuration of three-phase circuits
- apply formulas for balanced connections
- calculate transfer function and phase shift
- express transfer function in Bode format and draw Bode plots
- understand Decibel scale

NARS ATTRIBUTES : 1,4,13 (1,4 energy)

For Laboratory procedures: measurement, analysis, and reporting

- Design of passive and active filters
- Design of phase shifters
- Design of filters
- analyze measurements and display results
- customize Vi's for processing laboratory information

Contents

First-order circuits and step response - Second-order circuits and step response- Sinusoids and phasors- Sinusoidal steady-state analysis- AC power analysis- Three-phase circuits- Magnetically coupled circuits Frequency response- Laplace Transform.

TEXT: Microelectronic Circuits. Adel Sedra& Kenneth Smith. 2009

COM 212	Electronics Principles I	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:



Students will gain an understanding of the electrical properties of semiconductor devices, their models and their use in circuits. They will learn fundamental concepts necessary to analyze and design amplifiers and contemporary electronic circuits using diodes and MOSFETs.

The Student will be able to:

- Perform Analysis and design using models
- express diode, MOSFET and BJT regions of operation by function and bias
- determine region of operation, bias points
- determine equivalent circuits for any region
- depict COM on gate, drain, and source configurations
- analyze circuits for transfer functions of voltage, current and trans conductance
- determine 2nd harmonic distortion for single stage amplifiers with sinusoid inputs
- derive full expression for CS or CE configuration frequency response
- show relationship to open-circuit time constant and Miller effect approximation
- simulate circuits
- use simulation to confirm hand calculations for rectifier, single stage amplifiers, and simple inverters
- edit pSPICE models so that models match measurements

For Laboratory procedures: measurement, analysis, and reporting

- connect devices and evaluate bias circuits and time varying behavior
- analyze measurements and display results in Bode plots for transfer functions
- extract device properties (e.g. threshold voltage) from measured data
- use lab facilities to derive I-V characteristics of devices and
- customize Vi's for processing laboratory information

NARS ATTRIBUTES : 1,3

Contents

Introduction to semiconductor material properties; semiconductor diodes: structure, operation, and circuit applications; special diodes: Zener, LED, Solar cell and photodiode; Metal Oxide Field Effect Transistors (MOSFETs): structure, operation, and circuit applications; Bipolar Junction Transistor: structure operation, and circuit applications. Thyristors: Structure and I-V characteristics.

Lab: Introduction to the lab tools, I-V characteristics of diode, clipping circuits using diodes, rectification using diodes, Zener diode and regulators, BJT DC biasing, CE BJT amplifier. MOSFET DC biasing, CS MOSFET amplifier, simple AM receiver circuit.

TEXT: Microelectronic Circuits. Adel Sedra& Kenneth Smith. 2009

COM 213	Measurements and Control Elements	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

This course is designed to Develop the ability of the students to apply the fundamental concepts of measurements required to control various mechanical systems ,lectrcal systems and electro-.mechanical systems This ability is demonstrated by solving well-posed, closed-ended homework and exam problems.

Learning Outcomes



On successful completion of this course, students should be able to:

- Demonstrate an ability to apply fundamental concepts and problem-solving techniques to solve "real-world" problems. This ability is demonstrated by working in groups to develop solutions for open-ended problems.
- Evaluate laboratory measurement errors and uncertainties and their impacts on engineering predictions. This is accomplished by collecting data in laboratory experiments concerning the use of various sensors and signal conditioning systems.

NARS ATTRIBUTES : 1,3,5,14

Topics Covered:

Sensors and transducers: Performance terminology- Displacement, position and proximity sensors- Velocity and motion sensors- Force sensors- Fluid pressure sensors- Liquid flow sensors- Liquid level sensors- Temperature sensors- Light sensors- Selection of sensors

Signal conditioning: Signal conditioning- The operational amplifier- Protection- Filtering- Pulse modulation

Data presentation systems: Displays- Data presentation elements- Magnetic recording- Optical recording- Displays- Data acquisition systems- Measurement systems- Testing and calibration

Pneumatic and hydraulic actuation systems: Actuation systems- Pneumatic and hydraulic systems- Directional control valves- Pressure control valves- Cylinders- Servo and proportional control valves- Process control valves- Rotary actuators-

Mechanical actuation systems: Mechanical systems Types of motion- Kinematic chains- Cams- Gear trains- Ratchet and pawl- Belt and chain drives- Bearings

Electrical actuation systems: Electrical systems- Mechanical switches- Solid-state switches- Solenoids- D.C. motors- A.C. motors- Stepper motors- Motor selection

Lab:

Students will use basic instruments to carry out real time measurements that are necessary to familiarize them with the advanced concepts and updated technology in the measurements and control field. Experiments are organized in several groups of real time applications such as temperature, pressure, and level measurements. Applications are extended to cover data processing.

TEXTBOOK: Mechatronics: Electronic control systems in mechanical and electrical engineering, W. Bolton, 2011, ISBN 13-9780273742869

COM 215	Electronic circuits	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

Learning Outcomes

NARS ATTRIBUTES : 1,2,4

Topics Covered:



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Introduction to analysis and design of modern analog electronic circuits, diode circuits, bipolar and field effect transistor circuits, transistor amplifier circuits and operational amplifier circuits

The opposition and mixed constants for high frequency amplifiers – intermediate and harmonic amplifiers – Bode plot and the frequency response – the harmonic vibrators – circuits of mixing and modification – power amplifiers

Introduction to analysis and design of modern analog electronic circuits, diode circuits, bipolar and field effect transistor circuits, transistor amplifier circuits and operational amplifier circuits

The opposition and mixed constants for high frequency amplifiers – intermediate and harmonic amplifiers – Bode plot and the frequency response – the harmonic vibrators – circuits of mixing and modification – power amplifiers

TEXTBOOK:

COM 216	Automatic Control	Lecture : 2	Tutorial: 2	Lab:
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Specific Goals:

To provide students with the fundamental knowledge of controller design for automatic control systems

Practical & Professional Skills (Lab/ workshop work)

Upon completion of the subject, students will be able to:

- Formulate and solve problems relating to modeling of linear mechanical systems, analysis of system relative stabilities; determining specifications for open- or closed-loop control systems and designing controllers or compensators for mechanical systems.
- Complete a given task such as a project in system modeling or controller design by applying knowledge acquired in the subject and information obtained through literature search.



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- Analyze and interpret data obtained from experiments in system modeling, stability analysis or frequency-domain analysis of mechanical systems.
- Present effectively in completing written reports of laboratory work and the given task.

NARS ATTRIBUTES: 1,2,4

Contents

Review of mathematical background (complex variables, Laplace, Diff. Equations); System representation (block diagram, transfer functions, signal flow graph) Modeling of electric and mechanical systems; State variable analysis; Stability; Time domain analysis; Root locus; Bode diagram, Nyquist diagram, Frequency domain analysis; Introduction to PID control.

TEXTS:

1. M. Gopal, Control Systems, Principles and Design, McGraw-Hill, latest edition.
2. N.S. Nise, Control Systems Engineering, Wiley, latest edition.
3. K. Ogata, Modern Control Engineering, Prentice Hall, latest edition.

COM 223	Engineering Electromagnetics (1)	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

This course introduces the student to engineering electromagnetics as a building block for Communication engineering. Emphasizes are placed on introducing theories and solve engineering problems.

NARS ATTRIBUTES : 1,2,4

Contents

Review to vector calculus; Electrostatic fields; Columb's law; Gauss's law and divergence; Electric potential; Dielectrics and capacitance; Poisson's and Laplace's equations; Charge images; Current density and conductors; Magneto static fields; Biota-Savart and Ampere's laws; Curl and Stoke's theorem; Magnetic materials and circuits; Self and mutual inductances; Energy in static Fields.



TEXT:

Engineering Electromagnetics, William H. Hayt, Jr. and Johan A. Buck, McGraw Hill, 2012.

COM 311	Electrical Machines	Lecture : 2	Tutorial: 2	.Lab: 0
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Specific Goals: Students achieve;

- An understanding of modeling and operation of practical transformers
- An understanding of modeling and behavior of synchronous machines
- An understanding of modeling and behavior of Induction motors
- An understanding of modeling and behavior of dc machines

Practical & Professional Skills

- Apply Faraday's law to transformers with application to an equivalent circuit for a practical transformer.
- Find the relationship between real and reactive power control with application to the equivalent circuit of a synchronous machine
- Find the torque speed characteristics of an induction motor with application to the equivalent circuit of an induction motor.
- Understand the speed control of a dc machine with application to the equivalent circuit of a dc machine

NARS ATTRIBUTES : 9,11,12,13,14,and 15 (new energy 9,13)

Contents

Types of electric machines – direct current machines – multi-phase alternative current system – electric transformers – Induction machine – synchronizing machine –converters- small power engines – electric distribution systems – cables and their properties – electric machine safety – electric transformers safety.

Text:

Hubert, Electrical Machines-Theory, Operation, Applications, & Control, Prentice Hall.

Sen, Principles of Electric Machines & Power Electronics, Wiley

COM 234	Computational Techniques in Communication Engineering	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course introduces the students to numerical analysis and its applications in solving Communication engineering problems.

NARS ATTRIBUTES : 1,2,3,5,9,11,15,16,17

Contents



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Introduction to Numerical Analysis, Taylor Polynomials and Error in Taylor's Polynomial, Concept of Error, Root-finding (Bisection, Newton and Secant Method), Interpolation and Approximation, Lagrange Interpolating Polynomial, Newton's Polynomial, Numerical Integration and Differentiation, Systems of linear equations, Least Square method, Numerical Solution of Ordinary Differential Equation (ODE)

TEXT:

K. Atkinson and W. Han, "Elementary Numerical Analysis, John Wiley & Sons, L.E.3rd ed., 2004.

COM 224	Engineering Electromagnetics (2)	Lecture : 2	Tutorial: 2	Lab:0
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Specific Goals:

This course extends knowledge in electromagnetics required to build bases in solving problems of Communication engineering. Emphasizes are placed on introducing theories and its applications in real life.

NARS ATTRIBUTES : 1,2,4

Contents (Lectures)

Time varying fields; Faraday's law. Transformer and motional emfs; Displacement current; Maxwell's equations and time harmonic fields; Wave equation; Power transfer and Poynting vector; Plane wave propagation in free space, in lossy dielectrics and in good conductors; Polarization; Reflection of plane wave at normal and oblique incidence; Transmission line Theory; Impedance matching.

TEXT:

Engineering Electromagnetics , William H. Hayt, Jr. and Johan A. Buck, McGraw Hill, 2012.

COM 320A	Electronic design with aids of computer	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

The objective is to teach students fundamental concepts of Artificial Intelligence

Practical & Professional Skills

In relation to NARS (The Attributes of the Engineers, 2009)

8,9,10,11,12

Contents



The electronic systems and the circulating standard components in electronic and communications - the design of the schemata's and the printed circuits – the computer software packages in the electronic design – examples for the electronic design using these computer software packages.

TEXT

Computer Aids for VLSI Design (The VLSI Systems Series)

COM 320B	Fundamentals of Biomedical Engineering	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

The objective is to teach students fundamental concepts of Biomedical Engineering

Practical & Professional Skills

In relation to NARS (The Attributes of the Engineers, section 1.2)

Upon completion of the subject, students will be able to:

- (a) Apply knowledge of mathematics, science, and engineering
- (b) Design and conduct experiments, as well as to analyze and interpret data
- (c) Identify, formulate, and solve engineering problems
- (d) Have the broad education for global understanding
- (e) Have a recognition of the need for, and an ability to engage in life-long learning
- (f) Use the techniques, skills, and modern engineering tools

Contents

The safety and the insulations in the medical equipments - the manners of the noise deletion - the hearted helpful equipments – physiological measurements and the vital sensitivity - a processing of the vital signals and different photographic methods

Text:

The Biomedical Engineering Handbook, Third Edition: Biomedical Engineering Fundamentals 1st Edition by Joseph D. Bronzino (Author, Editor), Donald R. Peterson (Author)

COM 320C	Information systems	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

The objective is to teach students fundamental concepts of Information systems

Practical & Professional Skills

In relation to NARS (The Attributes of the Engineers, 2009)



8,9,10,11,12

Contents

Concepts of the information systems - components of the information systems - the functions of the information systems – organizing the function of information systems - the separate systems – manipulation of the commercial systems – systems of information management – decision support systems – expert systems – operating systems – office automation – implementation support systems – Data processing systems – files processing – data relationships – types of databases - relational databases - common databases – management systems - systems analysis - systems design – system manipulation – system maintenance

TEXT

Principles of Information Systems 13th Edition by Ralph Stair (Author), George Reynolds (Author)

COM 320D	Computer Circuits Design	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

Practical & Professional Skills

In relation to NARS (The Attributes of the Engineers, 2009)

8,9,10,11,12

Contents

Introduction to digital electronic - IC's fabrication technology- Binary circuit characteristics using transistors-logic gates families- types and characteristics, metal transistor gates- oxide -semiconductor and gates characteristics NMOS, CMOS, PMOS - regeneration digital logic circuits - flip-flops - schmit impulse -multi vibrator circuits - temporary ICS - semiconductor memory - ROM types ,static and dynamic writing - power sources and regulators - Energy loss Data Bus .

COM 320E	Artificial Intelligence	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

The objective is to teach students fundamental concepts of Artificial Intelligence

Practical & Professional Skills

In relation to NARS (The Attributes of the Engineers, 2009)

8,9,10,11,12

Contents

Fundamental of artificial intelligent – random search – knowledge coding – Mathematical logic for knowledge - engineering and expert systems – Natural language processing – Knowledge representation – production system – Robots – Condensed introduction to programming using Lisp language and overall review for programming by Prolog language – programming applications in AI field focussing on: structure of customer accounting system including research operations, logical presentation, and decision making process in the uncertainty case - computer vision and neural networks.



Text:

Artificial Intelligence: Artificial Intelligence for Humans (Artificial Intelligence, Machine learning) Paperback – August 6, 2016 by Jon Gabriel (Author)

COM 312	Microwave electronics	Lecture : 2	Tutorial: 2	Lab: 0
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2. Intended Learning Outcomes of Course related to Program outcomes (ILOs):

1, 5, 11

3. Contents:

Guidance for the rectangular and cylindrical waves – idle main components – the shell lines - microwaves transistors and amplifiers – low noise amplifiers – microwaves oscillators - idle surface components - the converters and the phase displacements.

COM 322	Signals and Systems Analysis	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This courses introduces the engineering science necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.

Practical & Professional Skills

NARS ATTRIBUTES : 9,11,12,13,14,15

Contents

Motivation and Applications, Signal Classifications, Signal Operations, Singularity Functions; Linear time-Invariant Systems and Convolution; Correlation; Fourier Series and Transform for continuous and discrete time signals; Frequency response; Laplace transform and applications.

Text:

V. Oppenheim , Alan S. Willsky, and S. Hamid Nawab, "Signals & Systems", Prentice



COM 323	Power Electronics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

Students will strengthen their knowledge and understanding of basic analog and digital circuits. Deepen their understanding of inductors and transformers employed in the power electronics industry including the origin of resistive and core losses as well as proximity effects. Gain an understanding of SPICE for analyzing PWM inductor based power electronics circuits. Learn the role of approximations in static and dynamic modeling of FET's, IGBT's, and Thyristors. Develop structured approach to DC PWM circuit analysis via volt-sec and current sec methods. Become familiar with commercial PWM electronics chips such as buck and synchronous buck converters

NARS ATTRIBUTES : 9,10,11,12,13,14,15

Contents

Classification of power electronics converters, Power semiconductor devices: terminal characteristics; Power converters: ac-ac converters, rectifiers, inverters, dc-dc converters and resonant converters; Applications in power systems.

Textbook: D. W. Hart, "Introduction to Power Electronics", Prentice-Hall, 2008.

COM 324	Satellite communication	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

The objective is to teach students fundamental concepts of tele

NARS ATTRIBUTES : 9,10,11,12,13,14,15,16,17

Contents

Introduction – considerations of the orbits – the joint of the radio frequency – the techniques of the modification – the elements of the satellite - elements of the land stations – technology of the numerous attainment – systems of Intel sat and DBS – the personal communications and the communications of the moving's across the satellites.

TEXT



Computer Aids for VLSI Design (The VLSI Systems Series)

COM 325	Introduction to Microprocessors	Lecture : 2	Tutorial: 0	Lab: 3
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Specific Goals:

This course introduces the student to microprocessor architecture; Addressing modes and techniques; Assembly language programming; Interrupt systems; Input/output devices and timing; Memory devices;. The course also focuses on future trends in microprocessors.

NARS ATTRIBUTES : 15

Contents

Microprocessors architecture; Addressing modes and techniques; Instruction set; Assembly language programming; Interrupt systems; Input/output devices and timing; Memory devices; Future trends in microprocessors.

Textbook: Triebel and Singh, "The 8088 and 8085 Microprocessors", Prentice Hall, 2000.

COM 326	Mobile communications systems	Lecture : 2	Tutorial: 3	Lab: 0
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Specific Goals:

Learning Outcomes

NARS ATTRIBUTES : 9,10,12,13,14,15,16,17

Topics Covered:

Principles of cellular radio – Mobile radio propagation and channel modeling , Multiple access methods, Physical and Logical channels, Digital mobile communication systems: TDMA, GSM, CDMA, WCDMA, multi – carrier and OFDM systems .

Lab:

TEXTBOOK:



ENG 420A	Robotics engineering	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course provides the student with an in-depth knowledge on theory, and working principles of conventional and emerging **Robotics engineering**. The applications of such technologies in current and future sustainable communication, fundamentals of solar radiation and geometry, and component used for **Robotics engineering** will also be covered in this course. The state-of-the-art information provided by this course will enable the student to conduct sustainability assessments on such systems by considering economic, environmental, and social criteria. .

NARS ATTRIBUTES: 9, 12,13,15,16

3. Contents:

Introduction in the theory and applications of robot - the space description of the robot - Robot mechanics and dynamics - The dynamic of robot motivators – the inverse motivators - the work of the motion path – kinematics and dynamics control of the robot (motion – force) – control of the motivators forces computer vision – robot programming languages – the fixed robot in the industrial sites – industrial applications.

TEXT

Robotics: Everything You Need to Know About Robotics from Beginner to Expert by Peter Mckinnon

COM 420B	Radar Systems	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course provides the student with an in-depth knowledge on theory, and working principles of conventional and emerging Radar Systems. The applications of such technologies in current and future sustainable communication, fundamentals of solar radiation and geometry, and component used for Radar Systems will also be covered in this course. The state-of-the-art information provided by this course will enable the student to conduct sustainability assessments on such systems by considering economic, environmental, and social criteria. .



3. Contents:

The basics and Types of the radar (pulse radar – Doppler – frequency formation) –the equipment's of the sending and the reception – the antennas – hammerLand surveyor the radar – measurements of the range, angle and speed – analysis of the research signals and continuation methods – properties of the reflected signals from the goals –applications in the military and civil fields and the remote sensations.

TEXT

Introduction to Radar Systems (Irwin Electronics & Computer Engineering) by Merrill Skolnik

COM 420C	Neural networks	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course provides the student with an in-depth knowledge on theory, and working principles of conventional and emerging. The applications of such technologies in current and future sustainable communication, Neural networks fundamentals of solar radiation and geometry, and component used for neural networks will also be covered in this course. The state-of-the-art information provided by this course will enable the student to conduct sustainability assessments on such systems by considering economic, environmental, and social criteria. .

NARS ATTRIBUTES: 9, 12,13,15,16

3. Contents:

Introduction to natural Neural structure – introduction to Artificial Neural Networks and parallel processing – Artificial Neural Networks main components – Neural Networks classification – supervised Neural Networks learning – self organizing learning – Neural Networks design – preprocessing data – network structure – learning Algorithms – artificial Neural Networks multilayer models – Hopfield model – Boltezman model - Neural Networks and expert systems – multilayer neural network applications

TEXT

Make Your Own Neural Network [Print Replica] Kindle Edition by Tariq Rashid

COM 420D	Introduction to VLSI Design	Lecture : 2	Tutorial: 2	Lab:
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Specific Goals:

This course provides the student with an in-depth knowledge on theory, and working principles of VLSI. The applications of such technologies in current and future sustainable communication, fundamentals of VLSI will also be covered in this course. The state-of-the-art information provided by this course will



enable the student to conduct sustainability assessments on such systems by considering economic, environmental, and social criteria. .

NARS ATTRIBUTES: 9, 12,13,15,16

3. Contents:

Design of VLSI circuits- Stick diagramming- NMOS transistors- Switch and gate Logic- PLAs- Finite-state machines- Design rules- CAD system- Speed and power considerations- Floor planning- Layout techniques- Fabrication of VLSI – Two basic MOS technologies and other available technologies- Oxidation- Photoengraving- Chemical etching diffusion.

Design of VLSI circuits- Stick diagramming- NMOS transistors- Switch and gate Logic- PLAs- Finite-state machines- Design rules- CAD system- Speed and power considerations- Floor planning- Layout techniques- Fabrication of VLSI – Two basic MOS technologies and other available technologies- Oxidation- Photoengraving- Chemical etching diffusion.

TEXT:

Introduction to VLSI Circuits and Systems 1st Edition by John P. Uyemura



COM 421	Digital Signal Processing	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course is designed to develop the ability of the students to apply the fundamental concepts of Digital Signal Processing. This ability is demonstrated by solving well-posed, closed-ended engineering problems.

NARS ATTRIBUTES : 9,10,12,13,14,15

.Contents

Characterization and classification of discrete-time (DT) signals and systems; Typical DT signal processing operations; Linear time-invariant (LTI) - DT systems; Linear constant- coefficient difference equations; Frequency-domain representation of discrete-time signals and systems; The discrete Fourier transform (DFT); The fast Fourier transform (FFT); The z-transform; Linear phase transfer functions; Digital Filter Structures; Finite-impulse response (FIR) digital filter design; Infinite-impulse response (IIR) digital filter design; Digital processing of continuous-time signals; Fundamentals of multirate digital signal processing; Applications.

Textbook: Sanjit K. Mitra , "Digital Signal Processing-A computer Based Approach", McGraw Hill, 2005.

COM 422	Digital communications	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

The objective is to teach students fundamental concepts of tele_communiommccations: different digital communication systems, their application, and susceptibility to noise. Statistical analysis of analog and digital systems in the presence of noise is taught in this course.

NARS ATTRIBUTES : 9,10,12,13,14,15,16,17

Contents

Basic elements of communications systems; Review of probability theory; Base-band pulse transmission (matched filters, inter-symbol interference); Eye pattern, Nyquist criteria; Equalization; Digital Pass-band transmission: Coherent PSK, FSK, QPSK, MSK, M-ary frequency & phase modulations, MQAM; Non-coherent orthogonal modulation; Power spectra and bandwidth efficiency of binary and quaternary modulation schemes; Channel capacity; Source coding; Error control coding (channel coding).

Textbook: Simon Haykin, " communication systems", John Wiley, 2009.



COM 423	Wave Propagation and Antennas	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is designed to solidify students' understanding of wave propagation on transmission lines and expand it to include Propagation models in mobile radio systems.

NARS ATTRIBUTES : 9,10,11,12,13,14,15

Contents

Wave-guides and cavities; Radiation and antennas; Antenna parameters; dipoles and loop antennas; traveling wave antennas; Aperture and patch antennas; Linear and planar antenna arrays; Basic propagation modes; Free-space propagation; Ground wave propagation; Sky wave propagation; Space (terrestrial) wave propagation; Introduction to Propagation models in mobile radio systems.

Textbook:

[1] Constantine A. Balanis, "Antenna Theory, Analysis and Design", Wiley-Interscience, 2005.

[2]: Christopher Haslett, "Essentials of Radio Wave Propagation", Cambridge University Press, New York, 2008.

COM 424	Communication networks	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

The objective of this course is to provide focus on modern concepts of satellite communication. Satellite communication is moving from large ground station type application to direct consumer type application. Students will gain a foundation of knowledge on the topics listed below.

NARS ATTRIBUTES : 9,11,12,13,14,15,16,17

Contents

Introduction to satellite communication; Basic orbit maneuver; Satellite orbit geometry and types (LEO, MEO and GEOs); Orbit characteristics; Telemetry, Tracking and COM and; Propagation characteristics; Frequency bands; Channel modeling, Satellite antennas and patterns; Earth stations; Modulation and multiple Access techniques; Satellite uplink and downlink: analysis and design; Frequency plan; Carrier and transponder capacity, Single carrier and multi-carrier transponder; VSAT; Modern satellite systems and applications.

Textbook: Pratt, Bostian, and Allnutt, "Satellitecommunication Systems", John Wiley & Sons, 2003.

COM 425	Microwave Engineering	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is designed to solidify students' understanding of wave propagation on transmission lines and expand it to include stripline and microstrip structures, as well as waveguides of rectangular and circular cross section, 2) Learn to analyze the network behavior of multiport microwave systems, 3) Be able to



design impedance matching networks, including multi-section broadband transformers. 4) Be able to analyze and design passive microwave components, including microwave resonators, power dividers, hybrid junctions, and microwave filters, 5) Be familiar with microwave CAD software for component design, 6) Enhance their skills in written communication, through a design project report, 7) Understand and quantify the effects of noise in microwave systems, and 8) Be able to quantify the signal and noise characteristics of microwave systems such as Communication networks, radars, and radiometers, and relate this to their design.

NARS ATTRIBUTES : 9,10,11,12,13,14,15,16,17

Contents

Basics of Microwave Engineering, RF Behavior of Passive Components, Chip Components and Circuit Board Considerations, Stripline and Microstrip circuits, Microwave network analysis, Impedance matching, Power dividers and directional couplers, Microwave filters, Active microwave components, amplifiers, oscillators and mixers.

Textbook: David Pozar, Wiley, " Microwave Engineering", 2004

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COM 426	Error Correcting Coding for Communication Systems	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course introduces the students to perform error correcting coding for communication systems.

NARS ATTRIBUTES : 9,11,12,13,14,15,16,17

Contents

Linear block codes, Galois fields; polynomials over $GF(q)$; cyclic codes; BCH and Reed-Solomon codes; Block codes performance in AWGN channels; convolutional codes and Viterbi decoding; bit error rate bounds for convolutional codes; Trellis coded Modulation (TCM); Interleavers; concatenated codes; Error control for channel with feedback; application of ECC in different communication systems and in storage media.

Textbook: Robert H. Morelos-Zaragoza, " The Art of Error Correcting Codes", John Wiley & Sons, 2006.

COM 427	Optical communications	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

1. Understand and derive Maxwell's equations, the wave equation, boundaries and polarization
2. Understand light-matter interactions, attenuation, and index of refraction
3. Understand wave guiding principles, types of waveguides, and the concept of a mode in fiber
4. Understand step-index fibers, cutoff, and calculate the mode of index and group velocity
5. Understand graded-index fibers, dispersion, birefringence, PM Fiber, DSF, DFF, and DCF
6. Understand random processes and their relationship to LTI systems and channels and calculate power spectral density for linear optical fiber with chromatic dispersion



- Understand effects (linear) of PMD
- Understand nonlinear fiber channel models and effects of the nonlinear index of refraction, numerically integrate a light field in fiber
- Understand effects of noise in fiber, transmitters, and amplifiers
- Derive an operational channel model for end-to-end optical communication system modeling

NARS ATTRIBUTES : 9,10,11,12,13,14,15,16,17

Contents

Optical propagation; Optical waveguides; Optical fibers: structure, attenuation, dispersion; Light sources; Light detectors; Optical Amplifiers; Optical Modulators; Digital optical COM indication systems: analysis and design; WDM and DWDM system and its components; Optical Switching; Optical networking: SONET, SDH, Wavelength routed networks; Ultrahigh capacity networks; Nonlinear effects; Optical Measurements: OTDR; eye patterns, optical spectrum analyzer.

Lab:

Fiber components and measurements, transmitters and detectors, fiber amplifiers, multimode fiber links, and wavelength division multiplexing. Course Information:

Lab 1: Basic Fiber Measurements (attenuation, numerical aperture, scattering)

Lab 2: Multimode Fibers (bandwidth, dispersion, time and frequency domain)

Lab 3: Single Mode Fibers (bandwidth, dispersion, pulse propagation)

Lab 4: Transmitters (Lasers, LEDs, bandwidth, spectra, modulation)

Lab 5: Receivers (PIN and APD detectors, SNR, noise, bandwidth)

Lab 6: Links (intersymbol interference, components, SNR, eye diagrams)

Lab 7: Jitter and Mask Testing (standards, system optimization)

Lab 8: Bit Error Rate Testing

Lab 9: Fiber Amplifiers (spectra, gain, saturation)

Lab 10: Amplified Link Project (Final Lab project, 80km link)

Textbook: Gerd Keiser, " Optical Fiber communications Approach", McGraw Hill, 2000.

COM 299	Internship	Lecture :	Tutorial: 0	Lab: 0
		160 Internship after the 2 rd year		

Specific Goals:

Students will spend additional time practicing skills in a work environment in order to fulfil Training Package assessment requirements.

Practical & Professional Skills (Lab/ workshop work)

Learning in the workplace will enable students to:

- progress towards the achievement of industry competencies
- develop appropriate attitudes towards work
- learn a range of behaviors appropriate to the industry
- practice skills acquired in the classroom or workshop



- develop additional skills and knowledge one

Contents

The Internship I in Communication engineering is comprised of 160 hours of work experience in a related dealership requiring the student to perform a variety of tasks. The student will be required to work eight hours per day for eight weeks. A training agreement between the employer and the college is required, as is a weekly summary of activities (tasks performed) prepared by the student

TEXTS: None

COM 399	Internship	Lecture :	Tutorial: 0	Lab: 0
		160 summer training after the 3 rd year		

Specific Goals:

Students will spend additional time practicing skills in a work environment in order to fulfil Training Package assessment requirements.

Practical & Professional Skills (Lab/ workshop work)

Learning in the workplace will enable students to:

- progress towards the achievement of industry competencies
- develop appropriate attitudes towards work
- learn a range of behaviors appropriate to the industry
- practice skills acquired in the classroom or workshop
- develop additional skills and knowledge one

Contents

The Internship I in Communication engineering is comprised of 160 hours of work experience in a related dealership requiring the student to perform a variety of tasks. The student will be required to work eight hours per day for eight weeks. A training agreement between the employer and the college is required, as is a weekly summary of activities (tasks performed) prepared by the student

COM 499	Capstone Project	Lecture : 1	Tutorial: 0	Lab: 6
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Specific Goals:

To provide students with a holistic understanding on Communication engineering systems, in his area of specialization either " communications" or Communication Power Engineering r

.NARS ATTRIBUTES : 6,7,11,13,14,15,16,17



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New and Renewable Energy

Engineering Department



New and Renewable Energy Engineering Department

1- Program Educational Objectives

A. Department Mission Statement

The Department's mission is to provide all students with opportunities to address complex and multi-faceted new and renewable energy engineering problems. The Department provides students with the fundamentals necessary to evolve in the profession and to respond to changing technological and societal needs. In addition, the Department's program provides the depth of preparation and fosters intellectual curiosity needed for graduate studies and research.

B. Program Educational Objectives

Following graduation our students are expected to:

- Successfully apply fundamental mathematical, scientific, and engineering principles in formulating and solving engineering problems;
- Work competently in new and renewable energy engineering areas of practice;
- Work effectively and conduct themselves ethically in their professional environment; and



- Develop improved skills and new skills to enhance the state of their practice in a dynamic professional environment.

C. STUDENT OUTCOMES

A. Student Outcomes

We have adopted the National Academic Reference Standards (NARS) as our own Program Outcomes. In order to develop improved skills and new skills to enhance the state of their practice in new and renewable energy Engineering, students must be able to: apply knowledge of mathematics, science, and engineering; understand the impact of engineering solutions in a global, economic, environmental, and societal context; have knowledge of contemporary issues; recognize the need for, and be able to engage in life-long learning; use the techniques, skills, and modern engineering tools necessary for engineering practice; and explain basic concepts in management, business, public policy, and leadership.

It is also expected that students will need to spend additional time practicing skills in a work environment and in completing projects and assignments, in order to fulfil Training Package assessment requirements. Work placement is a mandatory requirement within this Framework and appropriate hours have been assigned to each course.

(1)- Learning in the workplace will enable students to:

- progress towards the achievement of industry competencies
- develop appropriate attitudes towards work
- learn a range of behaviors appropriate to the industry
- practice skills acquired in the classroom or workshop
- develop additional skills and knowledge

(2)- **The graduates of the engineering programs should be able to:(NARS 2009)**

- 1- Apply knowledge of mathematics, science and engineering concepts to the solution of engineering problems.
- 2- Design a system; component and process to meet the required needs within realistic constraints.
- 3- Design and conduct experiments as well as analyze and interpret data.
- 4- Identify, formulate and solve fundamental engineering problems.
- 5- Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.
- 6- Work effectively within multi-disciplinary teams.
- 7- Communicate effectively.
- 8- Consider the impacts of engineering solutions on society & environment.
- 9- Demonstrate knowledge of contemporary engineering issues.
- 10- Display professional and ethical responsibilities; and contextual understanding
- 11- Engage in self- and life- long learning
- 12- Evaluate the sustainability and environmental issues related to mechanical power systems.
- 13- Use energy efficiently.
- 14- Apply industrial safety.
- 15- Apply and integrate knowledge, understanding and skills of different subjects and available computer software to solve real problems in industries and power stations.



- 16- Lead or supervise a group of engineers, technicians and work force.
- 17- Carry out preliminary designs of fluid transmission and power systems, investigate their performance and solve their essential operational problems.
- 18- Design, operate and maintain internal combustion and steam engines.

2 – Curriculum Description

The curricular structure is aimed to be consistent with the PEOs as follows:

- v. It provides ample opportunities in each of the nominal five years of study to ensure students can successfully apply fundamental mathematical, scientific, and engineering principles in formulating and solving engineering problems.
- vi. It ensures that graduates will be prepared to work competently in multiple core areas of New and Renewable Energy Engineering practice.
- vii. The multiple opportunities for group work culminating in the capstone design sequence lays the groundwork for graduates to work effectively and conduct themselves ethically in

the professional environment.

- viii. The balance of fundamentals and practice in the curriculum ensures graduates will be capable of furthering their education both formally and informally, and the general experience of being instructed by research-active faculty can implicitly inculcate graduates with the understanding of ongoing development and mastery of new knowledge.

3 - Graduation Requirements

In order to achieve a Bachelor Degree in New and Renewable Energy Engineering, a student must fulfill the following NARS requirements:

List of these Courses are as follows

Humanities and Social Sciences	8.3 %
Basic Science Courses	20 %
Basic Engineering Science Courses	29.3 %
Application and Design Courses	30 %
Engineering Culture	4 %
Business Administration	2.66 %
Projects and Practice	% 6

H. List of Humanities and Social Science Courses (625 Marks) 8.3%

HUM 051	English Language I	75
HUM 052	English Language II	75
HUM 053	Human Rights	75
HUM 054	Health, safety and Risk Assessment	75
HUM 151	Technical Writing	100



HUM 352	Foundations of Management	75
HUM 353	Macroeconomics	75
HUM 451	Critical Thinking	75

B. List of Basic Science Courses (1475 Marks) 19.66.3%

BAS 021	Engineering Statics	125
BAS 022	Calculus	125
BAS 023	Linear Algebra	125
BAS 031	Physics I	125
BAS 032	Physics II	125
BAS 041	General Chemistry	100
BAS 042	Engineering Chemistry	125
BAS 121	Calculus in Several Variables	125
BAS 122	Kinematics and Dynamics	125
BAS 123	Ordinary Differential Equations	125
BAS 124	Probability and Statistics	125
BAS 131	Engineering Physics	125

Technical Core Courses

C. List of Basic Engineering Science and Mathematics Courses (2250 Marks) 30%

AUT 012	Production Technology & Workshops	125
AUT 011	Engineering Drawing	125
AUT 111	Thermodynamics	125
AUT 211	Heat Transfer	125
AUT 212	Fluid Mechanics	125
AUT 213	Fluid Power and Control	125
AUT 214	Strength of Materials & Stress analysis	125
AUT 215	Mechanical Vibrations	125
COM 111	Logic Circuits	125
COM 112	DC Circuit Analysis	125
COM 212	Electronics Principles I	125
COM 213	Measurements and Control Elements	125
COM 216	Automatic Control	125

D. Computer Applications Courses

COM 131	Introduction to Programming	100
COM 132	Graphics and Computer-Aided Drawing	100
COM 133	Programming I	100
COM 231	Algorithms and Data Structures I	100



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COM 232	MATLAB	100
COM 431	Computerized Maintenance Management Software	125

E. Technical Core Courses in New and Renewable Energy Engineering
(2200 Marks) 29.3%

ENG 211	Internal Combustion Engines	125
ENG 310	Introduction to Electrical Power Engineering	100
ENG 311	Fuel Cell Technology	125
ENG 312	Solar Energy Technology	125
ENG 313	Wind Energy Technology	125
ENG 314	Biomass Energy Technology	125
ENG 315	Photovoltaic Cell Technology	125
ENG 316	Energy Storage Systems	100
ENG 411	Energy Conversion Technology	125
ENG 412	Mechanical Design	125
ENG 413	Modeling and Simulation of Energy Systems	125
ENG 414	Design principles of sustainable building	125
ENG 415	Power plants Technologies	125
ENG 416	Energy Management Systems (EMS)	125
ENG 320x	Elective Course 1	125
ENG 320x	Elective Course 2	125
ENG 420x	Elective Course 3	125
ENG 420x	Elective Course 4	125

F. Engineering culture BAS x7x (300 Marks) 4%

BAS 171	Environmental management	100
BAS 371	Engineering Management	100
BAS 372	Operation Researches	100

G. Business Administration BAS x8x (200 Marks) 2.66%

BAS 281	Project Management	100
BAS 081	Fundamentals of Marketing	100

H. Project & Training. (450 Marks) 6 %

ENG 299	Internship	75
ENG399	Internship	75
ENG 499	Capstone Project	300



Study Plan

New and Renewable Energy Engineering Preparatory year- 1st

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 011	Engineering Drawing	1	4	-	5	50	-	-	75	125	4
BAS 021	Engineering Statics	2	2	-	4	50	-	-	75	125	3
BAS 023	Linear Algebra	2	2	-	4	50	-	-	75	125	3
BAS 031	Physics I	2	-	2	4	25	-	25	75	125	3
BAS 041	General Chemistry	2	-	2	4	20	-	20	60	100	3
HUM 051	English Language I	2	-	2	4	20	20	-	60	75	2
HUM 053	Human Rights	2	-	-	2	25	-	-	50	75	2
Total		13	8	6	27						750

Preparatory year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 012	Production Technology & Workshops	2		4	6	25	-	25	75	125	3
BAS 022	Calculus	2	2	-	4	50	-	-	75	125	3
BAS 032	Physics II	2	-	2	4	25	-	25	75	125	3
BAS 042	Engineering Chemistry	2	-	2	4	25	-	25	75	125	3



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BAS 081	Fundamentals of Marketing	2	1	-	3	30			70	100	3
HUM 052	English Language II	2	-	2	4	15		15	45	75	2
HUM 054	Health, Safety and Risk Assessment	2	1		3	25	-	-	50	75	2
Total		14	4	10	28					750	

New and Renewable Energy Engineering 1st Year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
BAS 121	Calculus in Several Variables	2	2	-	4	50	-	-	75	125	3
BAS 122	Kinematics and Dynamics	2	2	-	4	50	-	-	75	125	3
BAS 131	Engineering Physics	2	2	-	4	50	-	-	75	125	3
COM 111	Logic Circuits	2	2		4	25	-	25	75	125	3
COM 131	Introduction to Programming	2	-	2	4	20	-	20	60	100	3
COM 132	Graphics and Computer-Aided Drawing	2	-	4	6	20	-	20	60	100	3
Total		12	8	6	26					700	

New and Renewable Energy Engineering- 1st Year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 111	Thermodynamics	2	2	-	4	50	-	-	75	125	3
BAS 123	Ordinary Differential Equations	2	2	-	4	50	-	-	75	125	3
BAS 124	Probability and Statistics	2	2	-	4	50	-	-	75	125	3
BAS 171	Environmental management	2	1		3	40			60	100	
COM 112	DC Circuit Analysis	2	2	2	6	25	-	25	75	125	3
COM 133	Programming I	2	-	2	4	20	-	20	60	100	3



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HUM 151	Technical Writing	2	-	1	3	20	-	20	60	100	2
Total		14	9	5	28					800	

New and Renewable Energy Engineering- 2nd Year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 212	Fluid Mechanics	2	2	-	4	50	-	-	75	125	3
AUT 211	Heat Transfer	2	2	-	4	50	-	-	75	125	3
BAS 281	Project Management	2	2		4	40			60	100	3
COM 216	Automatic Control	2	2	-	4	50	-	-	75	125	3
COM 212	Electronics Principles I	2	2	2	6	25	-	25	75	125	3
COM 231	Algorithms and Data Structures I	2	-	2	4	20	-	20	60	100	3
Total		12	10	4	26					700	

New and Renewable Energy Engineering- - 2nd Year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
AUT 213	Fluid Power and Control	2	2-	-	4	50	-	-	75	125	3
AUT 214	Strength of Materials & Stress analysis	2	2	-	4	50	-	-	75	125	3
AUT 215	Mechanical Vibrations	2	2	-	4	50		-	75	125	3
ENG 211	Internal Combustion Engines	2	2	2	6	25	-	25	75	125	3
ENG 299	Internship									75	
COM 213	Measurements and Control Elements	2	2	2	6	25	-	25	75	125	3
COM 232	MATLAB	2	-	2	4	25	-	25	50	100	3
Total		12	10	6	28					800	



New and Renewable Energy Engineering- 3rdYear- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
ENG 310	Introduction to Electrical Power Engineering	2	2	-	4	20	-	20	60	100	3
ENG 311	Fuel Cell Technology	2	2	-	4	50	-	-	75	125	3
ENG 312	Solar Energy Technology	2	2	-	4	25	-	25	75	125	3
ENG 320x	Elective 1	2	2	-	4	50		-	75	125	3
HUM 352	Foundations of Management	2	-	-	2	25	-	--	50	75	2
BAS 371	Engineering Management	2	2	-	4	40	-	-	60	100	3
BAS 372	Operation Research	2	2	-	4	40	-	-	60	100	3
Total		14	12	2	28					750	-

New and Renewable Energy Engineering- 3rdYear- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
ENG 316	Energy Storage Systems	2	2	2	6	20	-	20	60	100	3
ENG 313	Wind Energy Technology	2	2	-	4	50	-		75	125	3
ENG 314	Biomass Energy Technology	2	2		4	50	-		75	125	3
ENG 315	Photovoltaic Cell Technology	2	2	2	6	25	-	25	75	125	3
ENG 320x	Elective 2	2	2	-	4	50	-	-	75	125	3
ENG 399	Internship									75	
HUM 353	Macroeconomics	2	-	-	2	25	-	-	50	75	2
Total		12	10	4	26					750	

Elective Courses (ENG 320)



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Elective1

ENG 320A Electromechanical Energy Conversion

ENG 320B Production Cost Analysis

Elective 2

ENG 320C Engineering Thermodynamics

ENG 320E Fundamental of Power System

New and Renewable Energy Engineering- 4th Year- 1st Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
ENG 411	Energy Conversion Technology	2	2	-	4	50	-	-	75	125	3
ENG 420x	Elective 3	2	2		4	50			75	125	
ENG 412	Mechanical Design	2	4	-	6	40	-	-	85	125	4
ENG 413	Modeling and Simulation of Energy Systems	2	-	2	4	25	-	25	75	125	3
COM 431	Computerized Maintenance Management Software	2		2	4	25	-	25	75	125	3
ENG 499	Capstone Project	1	-	5	6	Continuous				-	-
Total		11	8	9	28					625	

New and Renewable Energy Engineering- 4th Year- 2nd Term

Course Code	Course Name	C. Hours				Marks Distribution					Exams' Time
		Lecture	Tutorial	Lab	Total	Activities	Oral	Lab	Written	Total	
ENG 420x	Elective 4	2	2	-	4	50	-	-	75	125	3
ENG 414	Design principles of sustainable building	2	2	-	4	50	-	-	75	125	3
ENG 415	Power plants Technologies	2	2	-	4	50	-	-	75	125	3
ENG 416	Energy Management Systems (EMS)	2	2	-	4	50	-	-	75	125	3
ENG 499	Capstone Project	1	-	6	7	150	150	-	-	300	-
HUM 451	Critical Thinking	2	-	-	2	25	-	-	50	75	2
Total		11	8	6	25					875	



وزارة التعليم العالي
المعهد العالي للهندسة و تكنولوجيا السيارات و الطاقة بهيليوبليس الجديد

Elective Courses (ENG420)

Elective course 3

AUT420A Intelligent Control Systems

AUT 420B Energy Storage Systems

Elective course 4

AUT 420C Combustion Technology

AUT 420D Quality Control

New and Renewable Energy Engineering



Course Description

Basic Engineering Science Courses

AUT 011	Engineering Drawing	Lecture : 1	Tutorial: 4	Lab: 0
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Specific Goals:

- Understand working drawings in ISO standards together with any written instruction.
- Knowledge of standards for conventional dimensioning and tolerancing, and geometric dimensioning and tolerancing appropriate to the ISO standards.
- Understand the rules of technical drawing and the prevailing latest ISO standards that govern those rules
- Using the manuals, tables, lists of standards and product catalogues

Learning Outcomes

- Use various drawing instruments
- Define Bases for interpreting Drawings
- Sketching Missing Views
- Sketching Three Views
- Sketching Pictorial Views



- Writing Dimensioning on Drawings
- Matching Drawings
- Using Abbreviations on Drawings
- Sketching Circular Features
- Sketching Inclined Surfaces Features
- Writing Dimensions on Cylindrical Holes
- Sketching Full Sections
- Sketching Half Sections

NARS ATTRIBUTES: 1, 2, 5

Contents:

- Drawing Instruments
- Lettering
- Geometric Construction
- Freehand Sketching
- Orthographic Projection with Instruments
- Primary Auxiliary Views
- Sections
- Dimensioning
- Tolerances
- Working Drawings

TEXTBOOKS:

Engineering Design Graphics: Sketching, Modeling, and Visualization, by James Leake and Jacob Borgerson

AUT 012	Production Technology & Workshops	Lecture : 2	Tutorial: 0	Lab: 4
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Specific Goals including practices in workshop

- To introduce students to the role of manufacturing in an economy and to show the relationship between design and manufacturing.
- To make students aware of the necessity to manage manufacturing processes and systems for the best use of material and human resources with particular emphasis on product safety and environmental considerations
- To introduce students to the scientific principles underlying material behavior during manufacturing processes
- To build up practical skills necessary to perform basic concepts of manufacturing via shaping, forming, machining, and assembly
- To develop a knowledge of appropriate parameters to be used for various machining operations
- To develop a knowledge of workshop practice and basic use of machine tools and workshop equipment.

NARS ATTRIBUTES: 1, 4, 6



LEARNING OUTCOMES

On successful completion of this course, students should be able to:

- Analyze various machining processes and calculate relevant quantities
- Have a basic knowledge of safe workshop practice and the environmental implications of machining process decisions
- Identify and explain the function of the basic components of a machine tool
- Understand the limitations of various machining processes with regard to shape formation and surface quality and the impact this has on design
- Understand the procedures and techniques involved for the manufacturing of components, and keep up to date with innovation through literature search.
- Carry out simple machining operations based on machining drawings

Contents:

Introduction to Engineering materials – Metallic and non-metallic materials – cast iron and steel furnaces – metal casting – metal forming – extrusion – bending – welding – turning – milling – shaping – drilling – simple measurement tools – production quality – practical hand skills in the workshop- introduction to industrial safety.

TEXT:

A Textbook of Workshop Technology: Manufacturing Processes, S. Chand Limited, Jan 1, 2008

AUT 111	Thermodynamics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is designed to enable students to analyze and evaluate various thermodynamic cycles used for energy production - work and heat, within the natural limits of conversion.

Practical & Professional Skills (Lab/ workshop work)

At the completion of this course, students will be able to

- To state the First Law and to define heat, work, thermal efficiency and the difference between various forms of energy.
- To identify and describe energy exchange processes (in terms of various forms of energy, heat and work) in aerospace systems.
- To explain at a level understandable how various heat engines work (e.g. a refrigerator, an IC engine, a jet engine).
- To apply the steady-flow energy equation or the First Law of Thermodynamics to a system of thermodynamic components (heaters, coolers, pumps, turbines, pistons, etc.) to estimate required balances of heat, work and energy flow.

In relation to NARS (The Attributes of the Engineers, section 1.2)

NARS ATTRIBUTES: 1, 3

Contents (Lectures + Tutorial)



وزارة التعليم العالي
المعهد العالي للهندسة و تكنولوجيا السيارات و الطاقة بهيليوبليس الجديد

Basic fundamentals and definitions – Energy concepts–Open and Closed systems – Energy equation for closed systems – Continuity equations – Energy equation for open systems – Steady and unsteady flow through open systems – Properties of pure substance – Ideal gas model – Reversible processes – Irreversible processes – First law of thermodynamics – Second law of thermodynamics – Carnot cycle – Heat engines and efficiency – Entropy – Entropy change – Properties of gas mixture and vapors – Enthalpy and internal energy of gas and vapors mixture– Laboratory Experimental.

TEXT:

Tipler & Mosca, Physics for Scientists and Engineers, 2008, McDermott, Shaffer ET. al., Tutorials in Introductory Physics, Updated Preliminary 2nd Edition 2011-2012



AUT 211	Heat Transfer	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is designed to introduce a basic study of the phenomena of heat and mass transfer, to develop methodologies for solving a wide variety of practical engineering problems, and to provide useful information concerning the performance and design of particular systems and processes.

Practical & Professional Skills

Upon completion of the subject, students will be able to:

- Understand the basic laws of heat transfer.
- Account for the consequence of heat transfer in thermal analyses of engineering systems.
- Analyze problems involving steady state heat conduction in simple geometries.
- Develop solutions for transient heat conduction in simple geometries.
- Obtain numerical solutions for conduction and radiation heat transfer problems.
- Understand the fundamentals of convective heat transfer process.
- Evaluate heat transfer coefficients for natural convection.
- Evaluate heat transfer coefficients for forced convection inside ducts.
- Evaluate heat transfer coefficients for forced convection over exterior surfaces.
- Analyze heat exchanger performance by using the method of log mean temperature difference.
- Analyze heat exchanger performance by using the method of heat exchanger effectiveness.
- Calculate radiation heat transfer between black body surfaces.
- Calculate radiation heat exchange between gray body surfaces.

NARS ATTRIBUTES: 1, 2, 4

Contents

Introduction to heat transfer- Steady-state one dimensional conduction heat transfer - One dimensional conduction heat transfer with heat generation - Heat transfer from extended surface and fins-Transient Heat Conduction- Fundamentals of Convection Heat Transfer- Forced Convection relations (external flow) - Forced Convection relations (internal flow) - Free Convection relations – Thermal radiation– Laboratory Experimental.

TEXT:

1. Y.A. Cengel and A.J. Ghajar, Heat and Mass Transfer: Fundamentals and Applications, McGraw-Hill, latest edition.
2. J.P. Holman, Heat Transfer, McGraw Hill, latest edition.
3. F.P. Incropera, D.P. Dewitt, T.L. Bergman and A.S. Lavine, Principles of Heat and Mass Transfer, John Wiley & Sons, Inc., latest edition.



AUT 212	Fluid Mechanics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course aims to introduce the student to the fundamentals fluid mechanics and its applications in process engineering. The focus will be on solving fluid flow problems and design of pipeline and equipment for fluid transportation.

Practical & Professional Skills (Lab/ workshop work)

At the completion of this course, students will be able to

- Demonstrate their understanding of the basic principles of static and fluid systems;
- Perform a basic analysis of static and fluid systems;
- Devise simple solutions to a range of problems in basic fluid flow;
- Present their understanding and analysis of problems using methodical and clearly demonstrated worked solutions;
- Use appropriate modelling tools to design pipelines and equipment;
- Undertake basic design calculations of fluid engineering systems; and
- Understand and articulate the principles that are in operation in a range of fluid motive and flow measuring devices.

NARS ATTRIBUTES: 1, 2, 4

Contents

Introduction – Fluid Principles Definitions – Fluid statics – Fundamentals of fluid motion – Fluid kinematics – Principal equations for mass continuity, energy conservation, and momentum in integral formula – Applications – Dimensional analysis and similarity – Laminar & Turbulent flow – Laminar flow cases – Steady flow in pipelines – Friction coefficient and losses – Minor losses – Methods of nets connection – Differential form of continuity and motion – Approximate and Analytical solutions – Flow through boundary layer – Potential flow theory – Flow around immersed bodies – Unsteady flow – Introduction to flow control – Introduction to computational fluid mechanics– Laboratory Experimental.

TEXT:

Franzini and Finnemore, Fluid Mechanics, 10 the Edition, McGraw-Hill,
ISBN: 0-07-243202-0



AUT 213	Fluid Power and Control	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course deals with theory, operation and application of industrial hydraulic and pneumatic systems. Emphasis is placed on component and system operation using practical lab applications. Maintenance, troubleshooting and electrical control of fluid power are included.

Practical & Professional Skills (Lab/ workshop work)

1. Identify hydraulic and pneumatic components.
2. Construct simple hydraulic and pneumatic circuits.
3. Apply rules relative to linear actuators for pressure, volume, flow and velocity.
4. Apply directional control valves in hydraulic and pneumatic circuits.
5. Calculate quantities related to the operation of hydraulic and pneumatic motors.
6. Apply pressure control valves and accumulators in operating hydraulic and pneumatic circuits.
7. Construct and test electrically controlled hydraulic and pneumatic circuits.

NARS ATTRIBUTES: 1,2,3,4

Contents

Introduction to fluid power - Hydraulic principles - Fluid for hydraulic systems - the basic components and functions of hydraulic and pneumatic systems and its standard symbols (Fluid control valves - Hydraulic pumps - Hydraulic motors - Auxiliary hydraulic devices – Design, operation, troubleshooting and applications of Hydraulic circuits (hydraulic coupling and torque convertor etc.) – air preparation and component, Pneumatic circuits and – Fluid logic control systems - Basic electrical control for fluid power circuits.

TEXT:

Fluid Power: Hydraulics and Pneumatics, 2nd Edition, James R. Daines



Specific Goals:

The underlying objective of this course is to teach students how to formulate solutions to problems requiring the application of suitable engineering theories for strength of material and stress and strain;

Practical & Professional Skills

- Explain and apply advanced knowledge of components in terms of principles of strength of materials
- Apply appropriate design standards to engineering problem
- Analyze systems under load

NARS ATTRIBUTES: 1, 2, 4

Contents (Lectures)

Material mechanical properties such as strength ductility toughness and strain energy -Concept of stress and strain analysis - Stress-strain Diagram – Types of Loads and forces - Equilibrium of simple mechanical elements-normal and shear forces – bending and torsion moments – stresses in loaded elastic bars- axial, bending, torsion-strains-rigidity-strain energy-stresses in combined loading-eccentric loads, inclined, bending and torsion-two-dimensional stresses-principle stresses-Mohr circle-theory of failure-applications: thin and thick cylinders-frames-and finite elements. Analysis and design of Beams for Bending - Beam Section Properties - Symmetric member in pure bending- Bending deformations –Shear stress and strain due to bending - Shear and Bending Moment Diagrams- Shearing Stresses in Beams- Transformations of Stress and Strain- Deflection of Beams Hardness Definition and hardness test. Behavior of materials under dynamic loads Fatigue and impact. Laboratory test - Tensile test - Compression test - Bending test - Shear test -Hardness test - Impact test - Torsion test- Fatigue test - Creep test.

TEXT:

2001.E.J. Hearn. Mechanics of Materials (3rd Ed).UK: Butterworth-Heinemann



AUT 215	Mechanical vibrations	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course introduces students to theory and application of mechanical vibrations. It includes damped and undamped vibrations with one or more degrees of freedom. Computer methods are emphasized.

Practical & Professional Skills (Lab/ workshop work)

- Understand the concept of lumped parameter analysis to represent a system as a set of masses, springs and dampers
- Evaluate the vibration characteristics of the system.
- Write Equations of motion of simple 1 and 2 degree of freedom quarter car model
- Evaluate the steady state response
- Evaluate the frequency response
- Evaluate the step response
- Use computers to obtain solutions for systems in which the external forcing function is non-periodic

NARS ATTRIBUTES: 1,2,3,4

Contents

Fundamental aspects of mechanical vibrations -Types and causes of various vibratory motions - free vibrations of un-damped and damped systems - Natural frequency and damping ratio - Harmonically excited vibrations - The theoretical aspects of general periodic vibrations and non-periodic vibrations are formulated by means of Fourier analysis and convolution integral. Vibrations of multiple degrees-of-freedom systems - Equations determining the natural frequencies and mode shapes of the system - Harmonically excited vibrations - Vibration control in relation to engineering design -Various vibration control concepts and techniques - The concepts of mathematical modeling of the vibratory systems.

TEXT:

Mechanical Vibrations by S. S. Rao, 4th Edition, Pearson-Prentice Hall, Upper Saddle River, NJ, 2004



COM 111	Logic Circuits	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

This course develops skills in the area of Boolean algebra and in the application of this mathematical area to practical digital engineering problems. Specifically the course is designed to bridge the area of Boolean algebra with digital circuits, since students learn to design and debug these circuits using tools and methodologies that are consistent with modern engineering practice (CPLDs and programming tools for them). Students also learn to build simple circuits and to construct more complex designs based hierarchically on these.

Learning Outcomes

The Student will be able:

- Representation of digital information: Number systems
- The basic logical operations: Truth tables

NARS ATTRIBUTES : 1,2,3

Contents

- Boolean algebra-
- Algebraic simplification
- Minterm and maxterm expansions
- Karnaugh maps
- Multi-level gate networks
- Multiple-output logic: Multiplexers, decoders, read-only memories, programmable logic arrays
- Combinational network design
- Flip-flops: Registers and information transfer
- Sequential network analysis and realization
- State tables: Reduction of state tables
- Introduction of asynchronous sequential networks

TEXT: Fundamentals of Logic Design. Roth, Jr./Kinney. 2013.

COM 112	DC Circuit Analysis	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:



This course introduces students to basic concepts of Electrical Engineering. Critical aspects in the professional education as the strategies to identify and solve technical problems, communication skills, ethics and the capability to work in teams are also addressed during the course.

The Student will be able to:

- use node and mesh analysis, source transformation and linearity to determine node voltage and loop currents
- find Thevenin and Norton Equivalent Circuits
- analyze basic OpAmp circuits
- analyze measurements
- perform of lab and measurement procedures
- write lab reports
- understands role of modeling and simulation

NARS ATTRIBUTES : 1,2,3,4

Contents

Basic concepts: System of units. Charge, current and voltage. Power and energy. Circuit elements

Basic Laws: Ohm's Law. Kirchhoff's Law. Series and parallel resistors.

Analysis: Nodal analysis. Mesh analysis

Circuit Theorems: Linearity. Superposition. Thevenin's theorem. Norton's theorem

Operational amplifiers: Introduction. Ideal Op Amp

Capacitors and inductors: Introductory ideas. Series and parallel capacitors. Series and parallel inductors.

Step response RC/RL circuits- Step response RLC circuits

Lab:

- Introduction to laboratory. Department rules, procedure, policies. Proper way to write a laboratory report. Safety Considerations, nature of voltage, current and resistance..
- Use of meters and the Feedback Kit Experiment
- Ohm's Law.
- Kirchhoff's Law
- Troubleshooting of Series and parallel Circuits. (resistance measurements)
- Troubleshooting of Series and parallel Circuits. (voltage measurements)
- Superposition
- Thevenin's Theorem

- Norton's theorem
- Ideal Op Amp
- RC/RL circuits
- RLC circuits

TEXT:



Mario C. Marconi & Stephen V. Milton, Fundamentals of Electric Circuits. Alexander, Charles & Sadiku, Matthew. 2012.

COM 212	Electronics Principles I	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

Students will gain an understanding of the electrical properties of semiconductor devices, their models and their use in circuits. They will learn fundamental concepts necessary to analyze and design amplifiers and contemporary electronic circuits using diodes and MOSFETs.

The Student will be able to:

- Perform Analysis and design using models
- express diode, MOSFET and BJT regions of operation by function and bias
- determine region of operation, bias points
- determine equivalent circuits for any region
- depict communication on gate, drain, and source configurations
- analyze circuits for transfer functions of voltage, current and transconductance
- determine 2nd harmonic distortion for single stage amplifiers with sinusoid inputs
- derive full expression for CS or CE configuration frequency response
- show relationship to open-circuit time constant and Miller effect approximation
- simulate circuits
- use simulation to confirm hand calculations for rectifier, single stage amplifiers, and simple inverters
- edit pSPICE models so that models match measurements

NARS ATTRIBUTES : 1,3

Contents

Introduction to semiconductor material properties; semiconductor diodes: structure, operation, and circuit applications; special diodes: Zener, LED, Solar cell and photodiode; Metal Oxide Field Effect Transistors (MOSFETs): structure, operation, and circuit applications; Bipolar Junction Transistor: structure operation, and circuit applications. Thyristors: Structure and I-V characteristics.

Lab: Introduction to the lab tools, I-V characteristics of diode, clipping circuits using diodes, rectification using diodes, Zener diode and regulators, BJT DC biasing, CE BJT amplifier. MOSFET DC biasing, CS MOSFET amplifier, simple AM receiver circuit.

TEXT: Microelectronic Circuits. Adel Sedra & Kenneth Smith. 2009

COM 213	Measurements and Control Elements	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:



This course is designed to Develop the ability of the students to apply the fundamental concepts of measurements required to control various mechanical systems , electrical systems and electro-.mechanical systems This ability is demonstrated by solving well-posed, closed-ended homework and exam problems.

Learning Outcomes

On successful completion of this course, students should be able to:

- Demonstrate an ability to apply fundamental concepts and problem-solving techniques to solve "real-world" problems. This ability is demonstrated by working in groups to develop solutions for open-ended problems.
- Evaluate laboratory measurement errors and uncertainties and their impacts on engineering predictions. This is accomplished by collecting data in laboratory experiments concerning the use of various sensors and signal conditioning systems

NARS ATTRIBUTES : 1,3,5,and 14(1,3,and 5 energy)

Topics Covered:

Sensors and transducers: Performance terminology- Displacement, position and proximity sensors- Velocity and motion sensors- Force sensors- Fluid pressure sensors- Liquid flow sensors- Liquid level sensors- Temperature sensors- Light sensors- Selection of sensors

Signal conditioning: Signal conditioning- The operational amplifier- Protection- Filtering- Pulse modulation

Data presentation systems: Displays- Data presentation elements- Magnetic recording- Optical recording- Displays- Data acquisition systems- Measurement systems- Testing and calibration

Pneumatic and hydraulic actuation systems: Actuation systems- Pneumatic and hydraulic systems- Directional control valves- Pressure control valves- Cylinders- Servo and proportional control valves- Process control valves- Rotary actuators-

Mechanical actuation systems: Mechanical systems Types of motion- Kinematic chains- Cams- Gear trains- Ratchet and pawl- Belt and chain drives- Bearings

Electrical actuation systems: Electrical systems- Mechanical switches- Solid-state switches- Solenoids- D.C. motors- A.C. motors- Stepper motors- Motor selection

Lab:

Students will use basic instruments to carry out real time measurements that are necessary to familiarize them with the advanced concepts and updated technology in the measurements and control field. Experiments are organized in several groups of real time applications such as temperature, pressure, and level measurements. Applications are extended to cover data processing.

TEXTBOOK: Mechatronics: Electronic control systems in mechanical and electrical engineering, W. Bolton, 2011, ISBN 13-9780273742869

COM 216	Automatic Control	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

To provide students with the fundamental knowledge of controller design for automatic control systems

Practical & Professional Skills (Lab/ workshop work)



Upon completion of the subject, students will be able to:

- Formulate and solve problems relating to modeling of linear mechanical systems, analysis of system relative stabilities; determining specifications for open- or closed-loop control systems and designing controllers or compensators for mechanical systems.
- Complete a given task such as a project in system modeling or controller design by applying knowledge acquired in the subject and information obtained through literature search.
- Analyze and interpret data obtained from experiments in system modeling, stability analysis or frequency-domain analysis of mechanical systems.
- Present effectively in completing written reports of laboratory work and the given task.

NARS ATTRIBUTES: 1,2,4

Contents

Review of mathematical background (complex variables, Laplace, Diff. Equations); System representation (block diagram, transfer functions, signal flow graph) Modeling of electric and mechanical systems; State variable analysis; Stability; Time domain analysis; Root locus; Bode diagram, Nyquist diagram, Frequency domain analysis; Introduction to PID control.

TEXTS:

1. M. Gopal, Control Systems, Principles and Design, McGraw-Hill, latest edition.
2. N.S. Nise, Control Systems Engineering, Wiley, latest edition.
3. K. Ogata, Modern Control Engineering, Prentice Hall, latest edition.



ENG 211	Internal Combustion Engines	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

The course introduces internal combustion engines theory, placing emphasis on normal and abnormal combustions, new technologies in the area, inspection including combustion chamber design and engine emissions control systems.

Practical & Professional Skills(including Lab/ workshop work)

1. Use and Maintain Tools and Measuring Equipment
2. Measure and analyze Engine Performance Parameters
3. Carry out Engines Compression test and Analyze Results
4. Diagnose Oil Pressure Problems.
5. Diagnose Cooling System Problems
6. Perform Crack Inspection.
7. Perform Valve Guide Inspection.
8. Adjust Timing of the Cam to the Crank.
9. Carry out exhaust gas measurements and analyze results
10. Checking Crank Condition and Engine Balancing
11. Use Workplace Technical Documents
12. Write Technical Reports

Contents

Principles of internal combustion engines – Classification of internal combustion engines - The fuel ,air standard cycle, Deviations between the actual cycle and fuel air standard cycle –fuels Properties – Combustion in spark ignition engine – Combustion chambers of spark ignition engines – Combustion in compression ignition engines – Combustion chambers of compression ignition engines – Performance of internal combustion engines – Engine emissions its control systems - Engine modern trends - Conventional and electronic ignition – fuel supply systems – air supply systems (super charging and turbo charging) .

TEXT: 1. Handbook of Automotive Engineering, Society of Automotive Engineers
International, latest edition.

ENG 310	Introduction to Electrical Power Engineering	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course will teach basic power generation, transmission and distribution, with the perspective of increased energy efficiency in both generation and consumption of electrical energy.

Practical & Professional Skills (Lab/ workshop work)

In relation to NARS (The Attributes of the Engineers, 2009)

1,4

Identify, formulate and solve fundamental engineering problems. **Contents**

Fundamentals of electrical power – maximum power transfer- single phase circuits- three phase circuits - wye-delta transformations - power factor – harmonics - transmission lines – insulators - power transformers – autotransformers - three phase transformers - resonance and power factor correction - building electrical systems.

TEXT:

Electrical Machines Drives and Power Systems. Theodore Wildi. 2005.

ENG 311	Fuel Cell Technology	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

To understand the expectancies of the hydrogen as a fuel and energy vector in the context of the renewable energy without CO₂ production, hydrogen production technologies with and without CO₂, hydrogen storage and distribution technologies, basic electrochemical principles of the hydrogen fuel cells, basic fuel cell design concepts, - fuel cell systems concepts, - how fuel cells are used for every day purposes: road, water and air transport vehicles, portable and stationary use. The underlying objective of this course is to teach the student how to model fuel as an integrated part of a system in order to analyze the performance behavior. Emphasizes are placed on new technologies, safety issues and cost expectations.

Practical & Professional Skills

Upon completion of the course, students will be able to:

- Understand basic hydrogen production (steam reforming, electrolysis etc.) and fuel cell technologies (PEM, SOFC, MCFC, AFC, PAFC etc.).
- Choose appropriate technology for particular purpose.
- Build the system model consisting of PV modules, electrolyze, compressor, hydrogen storage, PEM fuel cell and the resistive loads and simulate it using Simulink software.

NARS ATTRIBUTES : 9,10,11,12,13,15,16

Contents

Introduction to Fuel Cells - Fuel cell thermodynamics, kinetics, and catalysis – Different fuel cell types and their applications –Materials and operational fuel cell factors – Technology status and most important



design and test aspects – Fuel cell modeling and system integration: Balance of plant. - Fuel cell characterization – performance behavior, analysis and modeling - Hydrogen production and storage technologies - Safety issues and cost expectation, life cycle analysis of fuel cells - Geo-political, social, and environmental aspects. Lab: modelling and simulation using Matlab,

TEXT: Colleen Spiegel, PEM fuel cell modelling and simulation using Matlab, Elsevier Academic Press, 2008

ENG 312	Solar Energy Technology	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is designed to:

- To introduce the basic concepts and novel technologies in solar thermal systems; to provide a balance between both frontier technology updates and existing solar thermal energy strategies, in both a quantitative and qualitative way.
- To develop skills to design, model, analyze and evaluate solar thermal systems.
- To develop creative thinking and to deal with complex multidisciplinary solar thermal energy projects that involves the provision of effective and efficient solutions.
- To provide students for practical training in the design of different solar thermal systems, such as water heating and control, solar collection, solar energy storage and system design.

Practical & Professional Skills (Lab/ workshop work)

- Be able to understanding of principles and technologies for solar thermal energy collection, conversion and utilization.
- Be able to understanding of solar heating systems, liquid based solar heating systems for buildings.
- Be able to identify, formulate and solve simple to complex problems of solar thermal energy conversion and storage.
- Be able to identify and understand solar thermal systems' components and their function.
- Be able to analyze hot water load and solar resource data and use this information to properly size a solar thermal system.

NARS ATTRIBUTES : 9,10,11,12,13,15,16,17

Contents

Solar energy calculations- intensity- availability and usability – Solar angles- inclination- shades equation - Theory of the flat plate collector, transmission trough glass, heat loss calculations and all parameters related equation. Solar concentrators: Solar Heliostat- Point concentrators- Parabolic through- Fresnel concentrators. Thermal performance- heat transfer coefficients- efficiencies – Solar collector design – Solar concentrator array design - Design of solar power stations with energy storage.

Text: (1) J. S. Hsieh, Solar Energy Engineering, Prentice Hall, New Jersey;

(2) Soteris A. Kalogirou, Solar Energy Engineering: Processes and Systems, Academic Press (2009) (Reference book)



ENG 313	Wind Energy Technology	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

The objectives of the proposed course is to provide a broad understanding of the wind energy industry from component design and manufacturing, electric generation, transmission, and grid operations, to policy.

Practical & Professional Skills

- Communicate objectives of a long-term national energy portfolio and how wind energy will contribute to meeting those objectives
- Understand the wind energy systems and design tradeoffs for the large components (e.g., blade, turbine, tower, and foundation)
- Manufacturing and supply chain considerations for economic production.
- Identify problems and potential solutions associated with integrating high wind penetrations into the electric grid.
- communicate most significant reliability problems for wind turbines and be conversant with related monitoring technologies and maintenance methods to address them.
- Identify effects of existing and potential policies on wind energy growth

NARS ATTRIBUTES : 9,12,13,15,16

Contents

Introduction to Wind Energy –Wind resource and wind profiles - Classification of wind turbines -Structural design of Wind turbine blades – Aerodynamics of the wind turbine blade - Beam Theory - Wind Turbine Design – Wind Turbine Structures including blade composition and repair, nacelles, towers hub, Gearbox, generator, brakes, foundation, control system and structural inspection - Analysis of wind turbines performance - Wind Turbine Maintenance – Operation, inspections and maintenance safety procedure - Advanced Wind Turbine Troubleshooting – Grid connection of wind power - Control of wind turbines and wind power plants - Integration of variable wind power generation – wind energy economy.

Text: Sorensen, Brent. Renewable Energy: Physics, Engineering, Environmental Impacts, Economics and planning



ENG 314	Biomass Energy Technology	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is a new application technology fundamental course which covers the areas of thermal energy and power engineering, new energy science and engineering etc.

Practical & Professional Skills (Lab/ workshop work)

- Provide a thorough understanding of basic principles and system constructions of biomass energy conversion technology and utilization
- Provide design projects under conditions of specific biomass resources in Egypt requiring students to raise solvable plans with synthetic consideration of basic principles and policy support in team work form.

NARS ATTRIBUTES : 9,12,13,15,16

Contents

Introduce biomass as an energy carrier and the technologies associated with its exploitation - Sources of raw biomass - Methods of production, collection, processing of different sources – biomass characterization - technologies for the conversion of raw biomass into heat, electricity and fuels - Thermochemical conversion technologies to produce gas fuels, including pyrolysis and gasification, and to produce liquid fuels such as methanol, biodiesel, or hydrocarbons similar to gasoline (petrol) or Diesel fuels - Biochemical conversion options to produce gaseous fuels including anaerobic digestion and to produce liquid fuels including via fermentation

TEXT:

PrabirBasu, Biomass Gasification and Pyrolysis-Practical Design and Theory, Science press,2011



ENG 315	Photovoltaic Cell Technology	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

This course provides the student with an in-depth knowledge on theory, and working principles of conventional and emerging solar photovoltaic (PV) technologies. The applications of such technologies in current and future sustainable energy systems, fundamentals of solar radiation and geometry, and materials used for photovoltaic cells will also be covered in this course. The state-of-the-art information provided by this course will enable the student to conduct sustainability assessments on such systems by considering economic, environmental, and social criteria. .

Practical & Professional Skills (Lab/ workshop work)

On successful completion of this course you should be able to:

- Apply an understanding of engineering fundamentals of different types of photovoltaic systems.
- Investigate and analyses energy services employing photovoltaic systems.
- Design solar cells employing knowledge of solar cell materials and working principles.
- Develop sustainable energy solutions employing photovoltaic technologies.
- Apply sustainable engineering values, including legal social, economic, ethical and environmental interests / impacts, to design of photovoltaic systems.
- Conduct research on photovoltaic systems.
- Advise on photovoltaic system proposals, designs, and/or R&D activities

NARS ATTRIBUTES : 9,10,11,12,13,15,16

Contents

The fundamentals of photoelectric conversion: charge excitation, conduction, separation, and collection - commercial and emerging photovoltaic (PV) technologies and various cross-cutting themes in PV: conversion efficiencies, loss mechanisms, characterization, manufacturing, systems, reliability, life-cycle analysis, and risk analysis - photovoltaic technology evolution in the context of markets, policies, society, and environment - Principles of solar cell operation- structure, electrical and optical characteristics-equivalent circuit - Crystalline silicon solar cells - Thin film technologies for PV- Energy production by a PV array - Energy balance in stand-alone PV systems- Standards, calibration and testing of PV modules and solar cells-PV system monitoring - Installation and utility-connected and off-grid Photovoltaic (PV) systems- Electric load analysis- system and component design and sizing- system sitting- shading- electrical and mechanical system configuration- safety, electrical and building code compliance supplemented with system installation.

TEXT: Photovoltaic: Fundamentals, Technology and Practice 1st Edit



AUT 420C ENG 316	Energy Storage Systems	Lecture : 2	Tutorial: 2	Lab: 2
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Specific Goals:

This course covers all types of currently-available energy storage systems, the fundamental principles of energy storage technologies, the main economics aspects of each technology and a case study analysis of a particular project. The various technologies discussed are categorized in conventional energy applications and recent new and renewable energy applications.

Practical & Professional Skills

At the end of the course, students will:

- Have a clear understanding of the need and the nature of the storage required in operating renewable energy systems
- Have a clear understanding of the different storage technologies currently in wide use within sustainable systems
- Can analyze and design a sustainable energy system with associated storage and assess its economics and technical operation

NARS ATTRIBUTES :9,10,11,12,13

Contents

Introduction to energy storage systems - Physical storage media: Compressed air, Electrochemical cells – hydrogen – Batteries: Lead acid, Ni-metal hydride, Lithium ion – Fuel cell: Polymer electrolyte membrane, Alkaline, Phosphoric acid, Molten carbonate, Solid oxide, and Regenerative - Fuel cell applications: Transport, Combined Heat and Power – Super capacitors – Small scale storage systems: flywheels and springs – hydraulic and pneumatic accumulators – continuous and standby uninterruptible power supplies – Large scale storage solutions: hydro pump, compressed air, underground gas reservoirs – Energy storage economics – Environmental implications of energy storage.

TEXT:

Energy Storage Fundamentals, Materials and Applications. Authors: **Huggins**, Robert

AUT 320A ENG 320 A	Electromechanical Energy Conversion	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:



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The course aims at developing a general understanding of energy systems with focus on understanding and analyzing energy conversion including system design and theory of operation. The course also focuses on understanding the environmental consequences of energy conversion.

In relation to NARS (The Attributes of the Engineers,2009)

9,10,11

Contents

Transformers (construction, operation of single-phase transformers, equivalent circuit, voltage regulation and efficiency, auto-transformer, three-phase transformers), AC machinery fundamentals, three-phase induction machines (construction, operation, equivalent circuit, performance, calculations, starting of induction motors, speed control), small AC motors (single-phase induction motors, reluctance and hysteresis motors, universal motors, servo motors, stepper motors).

Textbook:

Fundamentals of Electromechanical Energy Conversion

AUT 320B ENG 320 B	Production Cost Analysis	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

In relation to NARS (The Attributes of the Engineers,2009)

9,10,11

Contents

Analysis of cost elements; cost centers; computer based production cost systems; production cost for linear and nonlinear production systems; minimum and maximum break-even output levels; average cost output level; profits and sales revenues levels; cost control..

AUT320C ENG 320 C	Engineering Thermodynamics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

In relation to NARS (The Attributes of the Engineers,2009)



9,10,11

Contents

..Fundamental concepts - Properties of a pure substance – Equation of state - thermodynamic systems - Work and heat - First law of thermodynamics; Applications to Systems and Control Volumes - Second Law of Thermodynamics; Principle of Carnot cycles; Heat engines, Refrigerators and heat pumps - Principle of the increase of entropy - Applications to systems and control volumes - Irreversibility and availability - Power and refrigeration cycles.

Text Books

Thermodynamics: An Engineering Approach (Mechanical Engineering) 8th Edition by Yunus Cengel (Author), Michael Boles (Author)

AUT320D	Fundamental of Power System	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course will teach basic power generation, transmission and distribution, with the perspective of increased energy efficiency in both generation and consumption of electrical energy.

In relation to NARS (The Attributes of the Engineers, section 1.2)

1,3,9,11

Contents (Lectures)

Power system components and representation. Transmission line and cable parameters. Per Unit calculations. Analysis of transmission and distribution lines. Electric insulators. Grounding systems. High voltage surges. Protection system.

Textbook:

Power System Analysis and Design (Activate Learning with these NEW titles from Engineering!) By J. Duncan Glover, Thomas Overbye, Mulukutla S. Sarma

ENG 411	Energy Conversion Technology	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

The course aims at developing a general understanding of sustainable energy systems with focus on:

1. Understanding and analyzing energy conversion, utilization and storage for renewable technologies such as wind, solar, biomass, fuel cells and hybrid systems and for conventional fossil fuel-based technologies;



2. Using the first and second law of thermodynamics and introductory thermodynamics to analyze renewable energy systems;
3. Understanding the environmental consequences of energy conversion and how renewable energy can reduce air pollution and global climate change

Practical & Professional Skills (Lab/ workshop work)

At the end of this course the student should be able to:

- Describe the challenges associated with the use of various energy sources, with regard to future supply and the environment;
- Quantify energy demands and make comparisons among energy uses, resources, and technologies.

NARS ATTRIBUTES :10,11,12,13,14,15,16

Contents (Lectures)

Energy resources - Contemporary energy conversion systems - Comparison of conventional and renewable energy conversion systems including limitations and efficiency of each - its comparative impacts on the environment. Applications include steam, gas, wind, and hydro turbine systems, internal combustion engines, fuel cells, solar energy converters, tidal and wave energy converters - other direct energy conversion devices used in plug-in hybrid electric vehicles.

TEXT: David JC MacKay. Sustainable Energy - Without the Hot Air. UIT Cambridge Ltd. 1st edition (2009)

ENG 412	Mechanical Design	Lecture : 2	Tutorial: 4	Lab: 0
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Specific Goals:

The underlying objective of this course is to learn how to quantitatively and qualitatively design COM on mechanical elements such as gears, shafts, bearings and fasteners. Having achieved these, the student will learn how to design a complete set of mechanical systems.

Practical & Professional Skills

- Define fatigue failure and its underlying mechanisms, and contrast to static failure
- Apply appropriate advanced static failure theories to predict part failure under general loading
- Analyze parts under general loading to predict fatigue failure
- Qualitatively identify fatigue failure progression from fracture surface inspection
- Specify appropriate couplers for transmission connections
- Perform detailed design of shafting including locating features



- Identify spur, helical, bevel and worm gear variants
- Specify pinion-gear and epicyclical/planetary arrangements and speeds to satisfy given functionality requirements (speed, power, size)
- Design spur and helical gear teeth for a given set of transmission specifications
- Select and analyze rolling element bearings suitable for a given application, including locating and non-locating functionality
- Specify required fasteners and torque specifications to guard against axial and shear failure and joint separation
- Design wet and dry clutches
- Recognize the environmental impact of mechanical design decisions

NARS ATTRIBUTES :10,11,12,13,14,15,16,17

Contents (Lectures + Tutorial)

Design principles - Margins and factor of safety – Design codes - Design of permanent joints - Design of detachable joints - Pre-stressed bolted joints - Design of shafts - Construction and design of couplings and chains - Clutches - Belt drives - Variable speed drives - Gears - Gear loading - Brakes - Rolling bearings - Rubbing and non- rubbing seals - Sliding bearings - Machining and assembly operations. Pressure vessel design using industrial codes like ASME, DIN or API.

TEXT:

Machine Design: An Integrated Approach, 5/E, Norton, R. L., Prentice Hall, 2014

ENG 413	Modeling and Simulation of Energy Systems	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course will introduce modeling, simulation and optimization techniques for various renewable energy systems. The course will be modular in nature. Each module will focus on a particular renewable energy application and relevant modeling/simulation tools. Some modules are independent and some will build on previous modules. The instructional format of the course will include lectures, scientific paper reviews, and some Matlab programming. Students will have an opportunity to apply new techniques to a relevant modeling project. The course will culminate with a modeling project relevant to renewable energy.

Practical & Professional Skills

- The course is intended to provide students with the following learning outcomes:
- deal with complex systems
- describe mechanical, electrical, thermal and fluid systems using energy-based methodology
- develop a realistic model of a given physical system



- predict and reproduce via analysis the system's dynamic behavior

Contents

Introduction to modeling and simulation – Types of Models and Simulations – Modeling of Energy-based Systems –Object Oriented Modeling – Modeling of physical systems e.g. electrical, hydraulic, thermal systems; electrical and hydraulic, mechanical and electro-mechanical systems; mechanical and electro-mechanical – Modeling of 3-D mechanical systems – Discrete Event Systems (DEVS) – Output data analysis – Simulation-Based Design – Simulation and optimization.

TEXT:

Modeling, Analysis and Optimization of Process and Energy Systems, F. Carl Knopf

ISBN: 978-0-470-62421-0



ENG 414	Design principles of sustainable building	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is designed to develop understanding of the context, principles and practice of environmentally sustainable design (ESD), with an emphasis on the energy and environmental performance of buildings. Furthermore, it develops the understanding of the strategies used in environmentally sustainable design and the performance assessment frameworks used to determine the sustainability of the built environment.

Practical & Professional Skills

- Determine and apply knowledge of complex sustainable building theory, principles and practice, to contribute to the design and management of sustainable buildings
- Critically analyses, synthesize and reflect on sustainable building theory and recent developments, both local and international, to extend and challenge knowledge and practice
- Professionally communicate and justify sustainable building design principles, strategies, solutions and/or outcomes, engaging effectively with diverse stakeholders, including across the government and industry sectors
- Adopt a building performance and systems approach, and apply specialist knowledge and technical skills to creatively address the diverse needs of sustainable building stakeholders

NARS ATTRIBUTES :10,11,12,13,14,15,16

Contents (Lectures)

Introduction to sustainable building Concept - Environmental Impacts of Construction Process Stages
Sustainable building codes - Sustainable sites selection - Sustainable building materials choice - Sustainable building indoor thermal comfort - Energy saving and atmosphere - Water efficiency management – Waste management systems

TEXT: Green Building, Principles and Practices in Residential Construction



ENG 415	Power plants Technologies	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is concerned with the types, construction, working principles and performance of different types of conventional and non-conventional power plants.

Practical & Professional Skills(Lab/ workshop work)

1. Describe types of power plants
2. Analyze different types of steam cycles and estimate efficiencies in a steam power plant
3. Describe basic working principles of gas turbine and diesel engine power plants. Define
4. Evaluate the performance characteristics and components of such power plants
5. List the principal components and types of nuclear reactors.
6. Evaluate cycle efficiency and performance of a gas cooled reactor power plant
7. Classify different types of coupled vapor cycles and list the advantages of combined cycles power plant
- List different types of fuels used in power plants and estimate their heating values
8. List types, principles of operations, components and applications of steam turbines, steam generators, condensers, feed water and circulating water systems.
9. Estimate different efficiencies associated with such systems
10. Define terms and factors associated with power plant economics and estimate the cost of producing power per kW

NARS ATTRIBUTES : 12,13,14,15,16

Contents

Steam power plants - Analysis of steam cycles – thermal power Plants components – Thermal analysis and power plant performance – New trends of thermal power plants – Binary power plants - Gas turbine power plant (simple plant components – Thermal Analysis and performance of each component - Steam/Gas turbine power plant (Combined Cycle) – Hydraulic power plants – Nuclear power plants - Plant Operation and Control - Plant economy and selection).

TEXT: Power Plant Engineering by Raja and Srivastava and Dwivedi, New Age International Pub., 2006



ENG 416	Energy Management Systems	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

Explore the design principles and practical applications of modern energy management systems, ISOs, and RTOs. Examine hardware, software, communications, and user interfaces. Develop a clear understanding of the philosophy of modern power system operations and the role of energy management systems, their design, and actual implementation. Survey past and current practices, as well as trends in the state-of-the-art design of energy management systems. Discuss new requirements imposed by deregulation, open access, and competition.

Practical & Professional Skills

- Define energy management
- Provide a rationale for industrial energy management
- Describe energy supply pressures and government actions
- Explain effective energy management as a multi-dimensional activity

NARS ATTRIBUTES :10,11,12,13,14,15,16

Contents

Principles and applications of energy management – Energy auditing – Analysis and evaluation of thermal and electrical loading of buildings and industrial processes- timing and efficiency of load components - Improving efficiency of thermal and electrical loads- Economic analysis- Fundamentals of energy saving – Fields and methods of saving – Energy saving in industrial fields – Practical applications for energy saving – Application of energy codes - Net-zero designs - Life-cycle economic analysis - Use of software tools for analyzing building energy systems.

TEXT:

Building Energy Management Systems Textbook Solutions



ENG 420A	Intelligent Control Systems	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course is designed to cover the 4 main areas of Intelligent Control Systems including: Intelligent Modeling, Optimization methods, Intelligent Control Strategies, and Multivariate Systems and Applications. Emphasizes are placed on practical applications related to electrical engineering industries.

Practical & Professional Skills

Upon completion of the subject, students will be able to:

1. Learn the unified and exact mathematical basis as well as the general principles of various soft computing techniques.
2. Provide detailed theoretical and practical aspects of intelligent modeling, optimization and control of non-linear systems.
3. Develop intelligent systems through case studies, simulation examples and experimental results.

Contents:

Principles of intelligent system - Fuzzy control - neural control - genetic algorithms - learning control - distributed intelligent control

Students are required to carry out programming as part of the project using either matlab or C or C++.

TEXTS:

Intelligent Control Systems by Alfred Silva

Y.C. Shin and C. Xu, Intelligent Systems: Modeling, Optimization and Control, CRC Press, 2008.



ENG 420B	Storage energytechnologies	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

The objectives of the proposed course is to provide a broad understanding of the Storage energytechnologies from component design and manufacturing, electric generation, transmission, and grid operations, to policy.

Practical & Professional Skills

- Communicate objectives of a long-term national energy portfolio and how wind energy will contribute to meeting those objectives
- Understand Storage energytechnologies and design tradeoffs for the large components (e.g., blade, turbine, tower, and foundation)
- Manufacturing and supply chain considerations for economic production.
- Identify problems and potential solutions associated.
- Communicate most significant reliability problems for wind turbines and be conversant with related monitoring technologies and maintenance methods to address them.
- Identify effects of existing and potential policies on wind energy growth

Contents

Supper Capacitors: structure,ratings,characteristics, usewiththewind power plant,fuel cells, and photovoltaicinterface,Superconducting magneticenergy storage(SMES):structure, operation, Batteries: types, characteristicsand operation, chargeand discharge, Fuelcell: types, electrochemicalmodel, performance,Flywheels energystorage.

Text: Electric and Hybrid Vehicles, 1st Edition, Gianfranco Pistoia



AUT 420C ENG 420C	Combustion Technology	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

The aim of this course is to provide students with the required fundamental knowledge in laminar and turbulent combustion. The laminar combustion topic will mainly be on flame theory, including premixed and diffusion flame structure as well as flammability limits. The turbulent combustion part will cover the different regimes in premixed combustion including a common expression for the turbulent burning velocity, as well as the flamelet concept and its applications for non-premixed turbulent combustion.

Contents

The basic principles of combustion highlighting the role of chemical kinetics, fluid mechanics, and molecular transport in determining the structure of flames - laminar and turbulent combustion of gaseous and liquid fuels including the formation of pollutants - Equilibrium compositions, flammability limits, simple chemically reacting systems, detailed chemical kinetics, and the basic theory underlying laminar and turbulent combustion for both premixed and non-premixed cases- droplet combustion - the concept of mixture fraction for non-premixed flames – Combustion aerodynamics – Combustion emissions control system – Design of burners and its control systems – Furnace design.

TEXT: Combustion, Fourth Edition 4th Edition, by Irvin Glassman and Richard A. Yetter

AUT 420D ENG 420D	Quality Control	Lecture : 2	Tutorial: 2	Lab: 0
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3- Contents

Design of quality control systems; quality methods for establishing product specifications; process control; variables and attributes charts; acceptance sampling; operating characteristics curves; process capabilities; QC software

COM 299	Internship	Lecture :	Tutorial: 0	Lab: 0
		160 after the 2 nd year		

Specific Goals:



Students will spend additional time practicing skills in a work environment in order to fulfil Training Package assessment requirements.

Practical & Professional Skills

Learning in the workplace will enable students to:

- progress towards the achievement of industry competencies
- develop appropriate attitudes towards work
- learn a range of behaviors appropriate to the industry
- practice skills acquired in the classroom or workshop
- develop additional skills and knowledge one

Contents

The Internship I in Automotive Engineering is comprised of 160 hours of work experience in a related dealership requiring the student to perform a variety of tasks. The student will be required to work eight hours per day for eight weeks. A training agreement between the employer and the college is required, as is a weekly summary of activities (tasks performed) prepared by the student

TEXTS: None

ENG 399	Internship I	Lecture :	Tutorial: 0	Lab: 0
		160 summer training after the 3 rd year		

Specific Goals:

Students will spend additional time practicing skills in a work environment in order to fulfil Training Package assessment requirements.

Practical & Professional Skills

Learning in the workplace will enable students to:

- progress towards the achievement of industry competencies
- develop appropriate attitudes towards work
- learn a range of behaviors appropriate to the industry
- practice skills acquired in the classroom or workshop
- develop additional skills and knowledge one

Contents

The Internship I in New and Renewable Energy Engineering is comprised of 160 hours of work experience in a related dealership requiring the student to perform a variety of tasks. The student will be required to



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work eight hours per day for eight weeks. A training agreement between the employer and the college is required, as is a weekly summary of activities (tasks performed) prepared by the student

TEXTS: None

ENG 499	Capstone Project	Lecture : 1	Tutorial: 0	Lab: 6
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Specific Goals:

To provide students with a holistic understanding on various new and renewable energy engineering systems, including the chassis, power train and transmission, suspension and steering, braking through practical appreciation and participation in designing, developing and building up a concept car

Practical & Professional Skills

- Understand new energy system structures and sub-systems;
- Design and develop and build up a new energy system
- Work practically on system design and manufacturing process.

Contents

Appreciation of the construction and design of a new energy system including various components. Systems may include: **Solar Energy, Wind Energy, and Biomass Energy**, etc.



Courses Description: Basic Sciences and Mathematics

BAS 021	Engineering Statics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course introduces the concepts of engineering based on forces in equilibrium. Upon successful completion of this course the student shall be able to:

1. draw complete free-body diagrams and write appropriate equilibrium equations from the free-body diagram, including the support reactions on a structure. Students will display proficiencies by demonstrating the following competencies:
 - a. Describe position, forces, and moments in terms of vector forms in two and three dimensions.
 - b. Determine rectangular and nonrectangular components of a force.
 - c. Determine the resultant of a force system including distributed forces.
 - d. Simplify systems of forces and moments to equivalent systems.



2. apply the concepts of equilibrium to various structures. Students will display proficiencies by demonstrating the following competencies:
 - a. Evaluate forces in trusses, frames and machines.
 - b. Determine the internal forces in a structure.
 - c. Analyze systems that include frictional forces.
3. calculate moments, centers of mass, and forces for particular structures. Students will display proficiencies by demonstrating the following competencies:
 - a. Centers of gravity and centroids for: 1) Discrete particles and a body of arbitrary shape. 2) A body having axial symmetry.
 - b. The resultant force of a pressure loading by a fluid. c. The moments of inertia for an area.

NARS ATTRIBUTES : 1,4

On completing this course, Student should be able to

- Apply Knowledge of BAS, science and engineering
- Identify, formulate, and solve engineering problems

Topics

- Force Vectors: a. Add forces and resolve them into components using the Parallelogram Law b. Express force and position in Cartesian vector form and determine vector's magnitude and direction introduce dot product to determine the angle between two vectors or projection of one vector onto another
- Equilibrium of a Particle a. Introduce concept of a particle free body diagram b. Solve particle equilibrium problems
- Force System Resultants a. Calculate moment of a force in two and three dimensions b. Find the moment of a about a specified axis c. Define the moment of a couple d. Determine the resultants of no concurrent force systems e. Reduce a simple distributed loading to a resultant force
- Equilibrium of a Rigid Body a. Develop equations of equilibrium for a rigid body b. Introduce the free-body diagram for a rigid body c. Solve rigid-body equilibrium problems
- Structural Analysis a. Determine forces in the members of a truss b. Analyze forces acting on pin-connected members of frames and machines
- Internal Forces a. Determine the internal loadings in a member using the method of sections b. Formulate equations that describe internal shear and moment throughout a member c. Analyze forces and geometry of cables supporting a load
- Friction a. Analyze the equilibrium of rigid bodies subjected to dry friction b. Present applications of frictional force analysis on wedges, screws, belts, and bearings c. Investigate the concept of rolling friction
- Center of Gravity and Centroid a. Discuss the concept of center of gravity, center of mass, and the centroid b. Determine the location of the center of gravity and centroid for a system of discrete particles c. Find the area and volume for a body having axial symmetry using the Pappus and Guidinus theorems d. Find the resultant of a general distributed loading and apply it to finding the resultant force of a pressure loading from a fluid



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- Moments of Inertia a. Determine the moment of inertia for an area b. Determine the minimum and maximum moments of inertia for an area using the product of inertia c. Discuss the mass moment of inertia

Textbook:

Engineering Mechanics: Statics, 12th Edition, Russell C. Hibbeler, Prentice Hall; ISBN: 0136077900 or 9780136077909



BAS 022	Calculus	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

This course enables students to:

- Explain the Big Idea of Accumulation in terms of the definite and standard integrals. .
- Acquire the skills to calculate definite integrals, and calculate areas, volumes, and arc lengths.
- Be able to apply and combine ideas of accumulation in new contexts not specifically covered in the text.

NARS ATTRIBUTES : 1,4

Contents

Definite integral and its properties – mean value theorem of integral – the fundamental theorem of calculus- Indefinite integral – standard integrals.-Derivatives and integrals of hyperbolic and inverse hyperbolic functions- Integration methods: integration by substitution – integration by parts- integration by partial fractions – Other substitutions- L'Hospitals Rule - evaluation of area and volume of revolution- arc length- Numerical integration(Trapezoidal rule)-Polar coordinates-Polar curves graphs-Areas using polar coordinates. Engineering applications.

TEXTS

1. Swokowski, Olinick, and Pence: Calculus, SIXTH EDITION. John Wiley & Sons, New York
 2. R.E. Larsen and R.P. Hostetler: Calculus with Analytic Geometry, 5th edition, D.C. health and
 3. company, 1994.
- H. Anton: Calculus with analytical Geometry, 4th edition, John Wiley & sons, New York, 1992.

BAS 023	Linear Algebra	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals: This course enables students to:



1. To use mathematically correct language and notation for Linear Algebra.
2. To become computational proficiency involving procedures in Linear Algebra.
3. To understand the axiomatic structure of a modern mathematical subject and learn to construct simple proofs.
4. To solve problems that apply Linear Algebra to Chemistry, Economics and Engineering.

Learning Outcomes: Upon successful completion of this course, students will:

1. Solve systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion.
2. Carry out matrix operations, including inverses and determinants.
3. Demonstrate understanding of the concepts of vector space and subspace.
4. Demonstrate understanding of linear independence, span, and basis.
5. Determine eigenvalues and eigenvectors and solve eigenvalue problems.
6. Apply principles of matrix algebra to linear transformations.
7. Demonstrate understanding of inner products and associated norms.

On completing this course, Student should be able to

- Apply Knowledge of BAS, science and engineering
- Identify, formulate, and solve engineering problems

NARS ATTRIBUTES : 1,4

Contents

Matrices and their operations- Types of matrices- Elementary transformations- Determinants elementary-properties of determinants- Inverse of a matrix- Rank of matrix- Linear systems of equations- Vector spaces- Linear independence - Finite dimensional spaces - Linear subspaces- Inner product spaces-Linear mappings- Kernel and image of a linear mapping- Eigenvalues and eigenvectors of a matrix and of a linear operator mapping.

TEXTS

1. H. Anton: Elementary Linear Algebra.
2. R. Allenby: Linear Algebra, Edward Arnold, London Sydney; 1995.
3. Blyth, T. S, and Robertson: Matrices and Vector Spaces; Chapman and Hall, London; 1989.

BAS 031	Physics 1	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

The course objectives include providing the student (1) a basic knowledge of mechanics, wave motion and thermodynamics, (2) a sufficient background in these areas so that the student will then be ready to take advanced courses in these areas, (3) the knowledge of these areas necessary to the pursuit of his major



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course of study, (4) an analytical approach to problem solving, both in science and "everyday life", and (5) an appreciation of the role of science in our current society, as well as in the past, and towards the future. The Course will lead students to:

- Set up and solve basic problems in mechanics, thermal physics and wave motion.
- Distinguish sense from nonsense.
- Analyze situations and develop rational courses of action.
- Determine the appropriate physical laws to apply to a situation.

NARS ATTRIBUTES: 1, 3

Contents

Kinematics of motion and vector algebra, dynamics of motion and Newton's laws. work and energy, conservation of energy, linear momentum including impulse and conservation of momentum, kinematics and dynamics of rotational motion, oscillations and harmonic motion, equilibrium of rigid bodies, fluid mechanics, heat and the laws of thermodynamics.

TEXTS

1. Physics for scientists and engineers with modern physics / Douglas C. Giancoli.
2. Physics Laboratory Experiments, 6th Edition, by Jerry D. Wilson and Cecelia A. Hernández; Houghton Mifflin Co, 2005. ISBN 0-618-38259



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Lab:

Experiment name	Outcomes
General Laboratory Instrumentations	<p>Students will learn...</p> <ul style="list-style-type: none"> The general procedures for conducting various elementary qualitative and quantitative experiments. How to collect and organize experimental data. The identity of typical laboratory equipment. The procedures for operating common laboratory equipment. The important safety precautions that should be practiced in the laboratory. collect data through the use of laboratory devises and electronic instrumentation record data and observations perform data analysis keep a professional notebook provide professional reports Proper and professional manner in which to present graphical data Describe the International system of units and its use in data analysis Describe the concepts of error, fractional error and standard deviation. Use the common mathematical notation utilized in physics data analysis. Describe the measurement and analysis of vector quantities. Make measurements of velocity, acceleration, force, torque, specific gravity and specific heat. Make measurements of wavelength, frequency, and velocity of a vibration. Calculate the error, fractional error and standard deviation for a given set of measurements. Use analytical balances, timers, meter sticks, vernier calipers, micrometers, and thermometers in measuring physical quantities. Convert temperature measurements from one scale to another. Write laboratory reports in the proper format. Analyze the sources of error in a measurement and hence calculate the limits of accuracy in that measurement. Develop plans of action to measure quantities in real physical situations Analyze situations and develop rational courses of action. Determine the appropriate measuring devices to apply to a situation. Develop an approach to the world around oneself based on the laws of nature and informed common sense. Distinguish between reality and superstition, and between science and pseudo-science.
Experimental Uncertainty & Data Analysis	
Measurements and Error	
Measurement Instruments (Mass, Volume, and Density)	
The Addition and Resolution of Vectors: The Force Table	
Kinematics of rectilinear motion	
Newton's Second Law: The Atwood Machine	
Acceleration of Gravity	
Measurement of coefficient of friction	
Projectile Motion The Ballistic Pendulum	
Work and Energy	
Torque, Equilibrium & Center of Gravity	
Simple Harmonic Motion	
Specific heat of a metal	
Mechanical Equivalent of Heat	

BAS 032	Physics 2	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:



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The course objectives include providing the student (1) a basic knowledge of electricity and magnetism, (2) a sufficient background in these areas so that the student will then be ready to take advanced courses in these areas, (3) the knowledge of these areas necessary to the pursuit of his major course of study, (4) an analytical approach to problem solving, both in science and "everyday life", and (5) an appreciation of the role of science in our current society, as well as in the past, and towards the future. The Course will lead students to:

- Set up and solve basic problems in DC circuits and Magnetism
- Distinguish sense from nonsense.
- Analyze situations and develop rational courses of action.
- Determine the appropriate physical laws to apply to a situation.

NARS ATTRIBUTES: 1, 3

Contents

Electric charge and electric field, Gauss's Law, electric potential, capacitance, dielectrics and electric energy storage, electric current and resistance, DC circuits, Magnetism, sources of magnetic including field, Biot-Savart law and Ampere's law, electromagnetic induction and Faraday's law

TEXTS

1. Physics for scientists and engineers with modern physics / Douglas C. Giancoli.
2. Physics Laboratory Experiments, 6th Edition, by Jerry D. Wilson and Cecelia A. Hernández; Houghton Mifflin Co, 2005. ISBN 0-618-38259



LAB:Physics 2

Experimentname	Outcomes
General Laboratory Instrumentations	Students will learn...
Electric Field Plotting	<ul style="list-style-type: none"> • The procedures for operating common laboratory equipment. • The important safety precautions that should be practiced in the laboratory. • Carry on experiments on electricity and magnetism • collect data through the use of laboratory devises and electronic instrumentation • record data and observations • perform data analysis • keep a professional notebook • provide professional reports
Specific charge of copper ions	
Verification of Ohm's Law	
Wheatstone Bridge	
Transmission of Power	
Electric Equivalent of Heat	
Potentiometers	
Capacitors in Series	
Capacitors in Parallel	
Experiment of Direct Current, DC	
Kirchhoff's rules	
Magnetic field of a current	
Electromagnetic induction	
Converging and Diverging Lenses	



BAS 131	Engineering Physics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals: The course objectives are to introduce extra fundamental principles of chemistry which are required for engineering education. A student should be able to:

- Demonstrate a comprehension of the fundamental principles and laws of stoichiometry, thermochemistry, chemical bonding, atomic structure, and chemical periodicity through graphing, drawing, use of formulas, and application in problem solving.
- Use problem-solving skills in applying the laws of kinetics, equilibrium, thermodynamics, electrochemistry, and nuclear chemistry.
- Recognize, describe, and predict products of acid-base reactions and redox reactions.
- Calculate pH, concentrations, and equilibrium constants.
- Apply techniques and principles of qualitative analysis using spectrophotometric and chromatographic techniques.
- Identify the properties of the major classes of organic compounds.
- Describe principles and experimental procedures clearly and briefly through writing of laboratory reports.

NARS ATTRIBUTES: 1, 3

Contents

Kinetics, equilibrium, ionic and equations, acid-base theory, electrochemistry, thermodynamics, Introduction to nuclear and organic chemistry, complex ions.

TEXTS

Silberberg, Martin S. Chemistry: The Molecular Nature of Matter and Change. 5 th ed., New York: McGraw Hill Higher Education, 2008. ISBN # 9780077216504



BAS 041	General Chemistry	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

The course objectives include providing the student (1) a basic knowledge of Chemistry, including Atomic and molecular structure, periodicity, chemical reactions, chemical bonding, stoichiometry, thermochemistry, gas laws, and solution (2) a sufficient background in these areas so that the student will then be ready to take advanced courses in these areas, (3) the knowledge of these areas necessary to the pursuit of his major course of study, (4) an analytical approach to problem solving, both in science and "everyday life", and (5) an appreciation of the role of science in our current society, as well as in the past, and towards the future. The Course will lead students to:

- Set up and solve basic problems in the course topics and other topics that don't relate to the course.
- Conduct experiments and analyze and interpret results
- Distinguish sense from nonsense.
- Analyze situations and develop rational courses of action.
- Determine the appropriate chemical laws to apply to a situation.

NARS ATTRIBUTES : 1,3

Contents

Atomic and molecular structure, periodicity, chemical reactions, chemical bonding, stoichiometry, thermochemistry, gas laws, solutions.

TEXTS

Silberberg, Martin S. Chemistry: The Molecular Nature of Matter and Change. 5th ed., New York: McGraw Hill Higher Education, 2008. ISBN # 9780077216504



LAB: General Chemistry

Experiment name	
General Laboratory Instrumentations	<p>Students will learn...</p> <ul style="list-style-type: none"> The general procedures for conducting various elementary qualitative and quantitative experiments in chemistry How to collect and organize experimental data. The identity of typical laboratory equipment. The procedures for operating COM on laboratory equipment. The important safety precautions that should be practiced in the laboratory. collect data through the use of laboratory devices record data and observations perform data analysis keep a professional notebook provide professional reports Proper and professional manner in which to present graphical data Describe the International system of units and its use in data analysis Describe the concepts of error, fractional error and standard deviation. Write laboratory reports in the proper format. Analyze the sources of error in a measurement and hence calculate the limits of accuracy in that measurement. Develop plans of action to measure quantities in real chemical situations Analyze situations and develop rational courses of action. Determine the appropriate measuring devices to apply to a situation. Develop an approach to the world around oneself based on the laws of nature and informed COM on sense. Distinguish between reality and superstition, and between science and pseudo-science.
Separating a sand and salt mixture	
Rate of evaporation	
Electricity from chemicals	
Unsaturation in fats and oils	
Melting and freezing	
The preparation and properties of oxygen	
Identifying polymers	
Preparing a compound from two elements	
The determination of relative atomic mass	
The reaction of a Group 7 element (iodine with zinc)	
Reactions of halogens	
The migration of ions	
The chemical properties of the transition metals – the copper envelope	
The reactivity of Group 2 metals	



BAS 042	Engineering Chemistry	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

The course objectives are to introduce extra fundamental principles of chemistry which are required for engineering education. A student should be able to:

- Demonstrate a comprehension of the fundamental principles and laws of stoichiometry, thermochemistry, chemical bonding, atomic structure, and chemical periodicity through graphing, drawing, use of formulas, and application in problem solving.
- Use problem-solving skills in applying the laws of kinetics, equilibrium, thermodynamics, electrochemistry, and nuclear chemistry.
- Recognize, describe, and predict products of acid-base reactions and redox reactions.
- Calculate pH, concentrations, and equilibrium constants.
- Apply techniques and principles of qualitative analysis using spectrophotometric and chromatographic techniques.
- Identify the properties of the major classes of organic compounds.
- Describe principles and experimental procedures clearly and briefly through writing of laboratory reports.

NARS ATTRIBUTES : 3

Contents

Kinetics, equilibrium, ionic and equations, acid-base theory, electrochemistry, thermodynamics, Introduction to nuclear and organic chemistry, complex ions

TEXTS

Silberberg, Martin S. Chemistry: The Molecular Nature of Matter and Change. 5 th ed., New York: McGraw Hill Higher Education, 2008. ISBN # 9780077216504



Lab: Engineering Chemistry

Experimentname	Outcomes
Diffusion in liquids	<p>Students will learn...</p> <ul style="list-style-type: none"> The general procedures for conducting various elementary qualitative and quantitative experiments. How to collect and organize experimental data. The identity of typical laboratory equipment. The procedures for operating common laboratory equipment. The important safety precautions that should be practiced in the laboratory. collect data through the use of laboratory devises record data and observations perform data analysis keep a professional notebook provide professional reports Proper and professional manner in which to present graphical data Describe the International system of units and its use in data analysis Describe the concepts of error, fractional error and standard deviation. Write laboratory reports in the proper format. Analyze the sources of error in a measurement and hence calculate the limits of accuracy in that measurement. Develop plans of action to measure quantities in real chemical situations Analyze situations and develop rational courses of action. Determine the appropriate measuring devices to apply to a situation. Develop an approach to the world around oneself based on the laws of nature and informed common sense. Distinguish between reality and superstition, and between science and pseudo-science.
Chemical filtration	
Rate of reaction the effect of concentration and temperature	
Reaction between carbon dioxide and water	
Extracting metal with charcoal	
The pH scale	
The reduction of iron oxide by carbon	
Testing the pH of oxides	
Making a pH indicator	
The reaction between a metal oxide and a dilute acid	
Testing for enzymes	
Testing water hardness	
Formation of a salt which is insoluble in water	
Titration of sodium hydroxide with hydrochloric acid	
The properties of ammonia	

BAS 121	Calculus in Several Variables	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

Outcomes of Instruction: To use fundamental concepts and devices including derivatives, integrals and the polar coordinates system as building blocks in solving engineering problems.

NARS ATTRIBUTES : 1,4

Contents

Function of two or more variables-Domain of the function-three dimension rectangular coordinates- Limits- Continuity-Partial derivative-Higher-order partial derivatives-Differentiation of composed function- Maxima and minima-Method of Lagrange multipliers for maxima and minima. Double integrals in Cartesian and Polar coordinates - Triple integrals in spherical and cylindrical coordinates- Infinite series-convergence tests- Presentation of functions by power series- Taylor and Maclaurin and the binomial series. Engineering Applications.

TEXTS

1. Swokowski, Olinick, and Pence: Calculus, SIXTH EDITION. John Wiley & Sons, New York
2. R.E. Larsen and R.P. Hostetler, Calculus with Analytic Geometry, 5th edition, D.C. health and company, 1994.
3. H. Anton, Calculus with analytical Geometry , 4th edition, John Wiley & sons, New York, 1992



BAS 122	Kinematics and Dynamics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

Kinematics and Dynamics have many practical applications and is fundamental to advanced topics in various disciplines of engineering. Challenges in the course include the difficulty in visualizing how particles move, encountering problems that do not seem related to theories and finding out that everything learned in statics, except the free body diagrams will not work in dynamics. By the end of this course, the student will be able to:

- 1) Outline the procedure to solve for displacement and velocity through the use of Newton's laws.
- 2) List the important dynamic quantities
- 3) Identify system for which dynamic quantities are conserved.
- 4) Identify conserved dynamical quantities in a given dynamical system
- 5) Apply appropriate kinematic principles to express velocities and accelerations in a dynamical system.
- 6) Construct free body diagrams for mechanical systems.
- 7) Derive mathematical models for dynamical systems.
- 8) Calculate dynamic quantities such as kinetic and potential energy, linear momentum and angular momentum of a dynamical system

NARS ATTRIBUTES : 1,2,4

Topics Covered:

Rectilinear and Curvilinear- Equations of Motion – Rectangular, polar and normal/tangential coordinates – Circular motion, relative motion – Newton's Law – Work-energy, potential energy, conservation of energy- Relative motion: velocity and acceleration – Impulse and momentum

TEXTBOOK: Engineering Mechanics: Dynamics, Hibbeler, Prentice-Hall



BAS 123	Ordinary Differential Equations	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

In this course **students** will study differential equations as mathematical descriptions of situations which arise in science and engineering. They will learn how to find the exact solution of some equations, but they will see that this is not always possible or practical. In these cases **students** will learn to extract information about the behavior of a solution from the differential equation itself. They will also study some simple techniques to find numerical approximations of solutions.

NARS ATTRIBUTES : 1,4

Contents

Basic definitions and construction of an ordinary differential equation- Methods of solving ordinary differential equations of first order - Orthogonal trajectories- Ordinary differential equations of high orders with constant coefficients and with variable coefficients- Types of solutions- Linear systems of ordinary differential equations- Series solutions of a linear ordinary differential equation of second order with polynomial coefficient- Laplace transform.

TEXTS

1. R.K.Nagle, E.B. Satt and A.D. Snider: Fundamentals of differential Equations& Boundary Value Problems. Addison Wesley, Longman, 2000.
2. Earl. D. Rainville and Philip E. Bedient: Elementary Differential Equations, 8th edition, New York, 1974.
3. Eare A. Coddington: An introduction to ordinary differential equations, New Jersey, 1961.



BAS 124	Probability and Statistics	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

a. Outcomes of Instruction:

- To enable students to create, simulate, and analyze elementary probability models
- To enable students to explain the limitations of the statistical inferences made therefrom.
- To assess students in understanding of mathematical concepts and their importance.
- To enable students to write math in a clear, concise way that emphasizes what's important

NARS ATTRIBUTES : 1,4

Contents

Introduction and overview of statistics and the definition of some statistical concepts -Organization and presentation of statistical data - Measures of central tendency (Mean, Median, Mode, etc.) of the simple data and the frequency distribution - Measures of dispersion (The Range – The Mean Deviation – The Variance and the standard deviation - Coefficient of variation of the simple data and the frequency distribution – Sets and the operations on sets - Sample space and Events - Counting Techniques (Fundamental basics, Addition Rule – Multiplication Rule- Permutation and Combinations) – Definition of the probability and its applications – Conditional probability - Independence of events and Bayes theorem and its applications – Definition of the random variable- The probability function (The probability Distribution)- The Expectation and the variance of the random variable (Discrete and Continuous) – Discrete probability Distributions (Bernoulli, Binomial and Poisson) – Continuous probability distribution (Normal distribution and its application). Engineering applications.

TEXTS

1. Perm S. Mann : Introductory Statistics , John wiley and sons, Inc., 2001
Harry Frank, Steven C. Althoen, Statistics concepts and Applications. Cambridge University, Press, 1994.

4- Teaching and Learning Methods

4.1 - lecture

4.2 - Tutorial

5- Weighting of Assessments

Mid-Term Examination	20 %
Final Term Examination	60 %
Oral Examination	0 %
Practical Examination	0 %
Semester work	20 %
Other types	0 %
Total	100 %



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Courses Description:

Computer Applications

COM 131	Introduction to Programming	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course provides students with an introduction to computer programming. It serve as building blocks in coming courses in this area. Further developing students strategies to identify and solve technical problems, COM unication skills, ethics and the capability to work in teams are also addressed in the course.

The Student will be able to:

- Understand various data types
- know general structure of a program



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- write programs using conditional Statements: If..Else, Switch; Loop: for, while, do .. while;
- write programmes to solve simple engineering problems

NARS ATTRIBUTES : 1,4,5

Contents

Data types, variables, assignment, general structure of a program; Input/Output; Arithmetic expression; Introduction to Classes and Objects; Relational operators; Boolean expression, logical operators; conditional Statements: If..Else, Switch; Loop: for, while, do ..while; Methods: Constructor, getter/setter, Method overloading; Array; Exception handling. Engineering applications

TEXT:

1. Deitel&Deitel, The Complete JAVA 2, 2002, Prentice-Hall.
2. Deitel&Deitel, VisualBasic.NET; How to program, 2002; Prentice-Hall
3. JAVA How to Program, H. M. Deitel, P. J. Deitel, 6th addition , 2004 Prentice Hall



COM 132	Graphics and Computer-Aided Drawing	Lecture : 2	Tutorial: 0	Lab: 4
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Specific Goals:

- To have sufficient knowledge of Autodesk Inventor to be able to configure the parameters of the software
- To have sufficient knowledge of computer operating systems to be able to use and manage computer files and software correctly
- Perform the modelling of the components, optimizing the constructive solid geometry.
- Use AUTOCAD

Learning Outcomes

- Using the manuals, tables, lists of standards and product catalogues
- Have sufficient knowledge of Autodesk Inventor to be able to configure the parameters of the software
- Have sufficient knowledge of computer operating systems to be able to use and manage computer files and software correctly
- Perform the modelling of the components, optimizing the constructive solid geometry.
- Produce and modify AutoCAD drawings suitable for basic mechanical engineering applications.

NARS ATTRIBUTES : 1,2,4,5

Contents:

- a. Getting started with AUTOCAD
- b. Basics of 2-Dimensionl drawings
- c. Basics of 2-Dimensionl Editing
- d. Editing
- e. Layers
- f. Blocks
- g. Layouts and Template Files
- h. Dimensioning Techniques
- i. Drawing of Mechanical and Electrical Systems

TEXTBOOKS:

Introduction to AutoCAD 2014 July, 2013 by Nighat Yasmin, ISBN-13: 978-1585037896



COM 133	Programming I	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

- To understand the various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs
- To learn to write programs (using structured programming approach) in C to solve problems.
- To introduce the students to basic data structures such as lists, stacks and queues.
- To make the student understand simple sorting and searching methods.

Learning Outcomes

- Produce and write and modify programs in "C" to solve engineering problems

NARS ATTRIBUTES : 1,4,5

Contents:

UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development.

Introduction to the C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements (making decisions) – if and switch statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, other statements related to looping –break, continue, goto, Simple C Program examples.

UNIT - II

Functions-Designing Structured Programs, Functions, user defined functions, inter function COM unication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs, Preprocessor COM ands.

Arrays – Concepts, using arrays in C, inter function COMunication, array applications, two – dimensional arrays, multidimensional arrays, C program examples.

UNIT - III

Pointers – Introduction (Basic Concepts), Pointers for inter function COM unication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string /data conversion, C program examples.

UNIT - IV

Enumerated, Structure, and Union Types– the Type Definition (typedef), Enumerated types, Structures – Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and



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functions, Passing structures through pointers, self-referential structures, unions, bit fields, C programming examples, COM and –line arguments,

Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files,

State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions, C program examples.

UNIT – V

Searching and Sorting – Sorting- selection sort, bubble sort, Searching-linear and binary search methods.

Lists- Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Push and Pop Operations, Queues- Enqueueurs and Dequeueur operations.

TEXTBOOKS:

1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.



COM 231	Algorithms and Data Structures I	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course visits the principles of programming and discrete math concepts that are necessary to the development, analysis and implementation of data structures

Learning Outcomes

- Produce and write and modify programs in "Java" to solve engineering problems
- proficiency in a minimum of four (4) recognized major electrical engineering areas

NARS ATTRIBUTES : 1,4,9,11 (1,4,11 energy)

Contents:

- Linear Data Structures: Stacks and Queues
- Advanced Sorting
- Trees
- Recursion
- Graphs
- Hash Tables
- OO: inheritance, polymorphism, abstract classes
- Relations
- Computational Complexity
- TEXT: Discrete Mathematics and Its Applications. Kenneth Rosen. 2012.
- Java: An Introduction to Problem Solving and Programming. Walter Savitch. 2011.



COM 232	MATLAB	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course is intended to provide an introduction to the use of computers to solve scientific and engineering problems. Various computational approaches to solve mathematical problems, such as solution of a set of linear equations, curve fitting, solution of differential equations and more (see syllabus) will be presented. The approaches will be covered along with a discussion of their limitations, eventually providing a mathematical judgment in selecting tools to solve scientific problems. MATLAB will be used as the primary environment for numerical computation. Overview of MATLAB's syntax, code structure and algorithms. Although the subject matter of Scientific Computing has many aspects that can be made rather difficult, the material in this course is an introduction to the field and will be presented in a simple as possible way. Theoretical aspects will be mentioned through the course, but more complicated issues such as proofs of relevant theorems/schemes will not be presented. Applications will be emphasized.

The Student will be able:

- To establish an understanding of MATLAB as an engineering and computational tool.
- To establish a familiarity with the MATLAB programming environment (syntax, basic commands, plotting, functions)
- To develop an understanding of and to gain experience in routine computer programming concepts in the MATLAB environment such as loops, functions and structures
- To develop an understanding of how standard mathematical and engineering problems can be solved numerically with a powerful programming tool.
- proficiency in a minimum of four (4) recognized major automotive engineering areas

NARS ATTRIBUTES : 1,5,9,11,15

Contents

Basic Skills: vector/matrix operations- using scripts- basic programming- branching and iteration- functions. Computational Analysis Framework: translating matrix formulations into MATLAB solutions- converting one-off scripts into reusable functions- using functions with external iteration to do parameter studies. Basic Data Analysis: reading in data- plotting- least squares fit- Monte Carlo Simulation- exposure to modeling non-deterministic systems- example simulations: particle settlement in fluid, vehicle loads on bridges- demonstrated advantage of vectored calculations versus manual for loops. 3D Data Analysis: contour and surface plots of $z = f(x, y)$ - applications to cut/fill analysis, stress fields. Numerical Integration: simple quadrature (cross section property calculation application via image processing): Euler's rule for $f(t) = g(f, t)$ (earthquake record applications). Numerical Differentiation: forward, backward, and centered difference schemes- traffic speed application via simple image sequence processing.

TEXTBOOK: MATLAB for Engineers, 3e, September 20, 2015, SBN 13:9780132103251

COM 235	Computer Organizations	Lecture : 2	Tutorial: 2	Lab: 0
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Topics Covered:



Introduction – computer orders - timing - operation – inputs and outputs - the boycott – design of a simple computer - basics of the assembly language and its properties - the properties of the assembler – Macros - organization of the central processor: transmitter - logical and arithmetic unit - the stacks – on forms of the orders - types of addresses - organization of microprocessors – control organization of the diminished programs – control memory - successiveness of the address - successiveness of the diminished programs - shapes of the diminished orders – design of arithmetic processor – dealings methods of numbers having signals - the organization of the entries and outputs - the hierarchical memory - the associative memory - the virtual memory - the liquid memory – circuits of the memory management.

COM 431	Computerized Maintenance Management Software	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course is designed to enable student to use standard maintenance computer programs as well as to design their own programs according to nature of practices.

Practical & Professional Skills(Lab/ workshop work)

Learning outcomes

1. Use standard maintenance computer programs in various automotive applications
2. Design specific maintenance computer programs according to nature of practices in various automotive applications, including:
 - a. Design of databases of maintenance planning and scheduling operations
 - b. Design of databases of preventive and predictive maintenance operations
 - c. Design of databases of stock and Storage planning
 - d. Design of databases of Shut down maintenance operations
 - e. Preparing computerized maintenance cost analysis
 - f. Preparing computerized maintenance reports

NARS ATTRIBUTES : 5,11+(15,17 energy)

Contents

Definition of maintenance and maintenance functions of departments - Types of Maintenance programs – Maintenance management and safety considerations – Maintenance management of COM on used equipment's – Planning and programming of maintenance manual format - The use of computers in the planning maintenance:-Maintenance of spare parts - Statistical methods and their use in maintenance costs- Case studies: preventive and preventive maintenance- maintenance planning and scheduling, maintenance reports- measuring ND improving maintenance performance parameters.

TEXT:



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Computerized Maintenance Management Systems 2nd Edition, by Terry Wirema, ISBN-13: 978-0831130541



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Courses Description:

Humanities and Social Sciences



HUM 051	English Language I	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

In view of the growing importance of English as a tool for global COMunication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students. By the end of this course it is expected that the student will be able:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.

NARS ATTRIBUTES : 7

Contents

Listening Skills:

Objectives

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language to be able to recognize them, to distinguish between them to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.
 - Oral practice
 - Describing objects/situations/people
 - Role play-Individual/Group activities (Using exercises from all the nine units of the prescribed text: Learning English: A communicative Approach.)
 - Just A Minute (JAM) Sessions

Reading Skills:

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.



2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.
 - Skimming the text
 - Understanding the gist of an argument
 - Identifying the topic sentence
 - Inferring lexical and contextual meaning
 - Understanding discourse features Scanning
 - Recognizing coherence/sequencing of sentences

NOTE:

The students will be trained in reading skills using the prescribed text for detailed study.

They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

Writing Skills:

Objectives

1. To develop an awareness in the students about writing as an exact and formal skill
2. To equip them with the components of different forms of writing, beginning with the lower order ones.
 - Writing sentences
 - Use of appropriate vocabulary
 - Paragraph writing
 - Coherence and cohesiveness
 - Narration / description
 - Note Making
 - Formal and informal letter writing
 - Describing graphs using expressions of comparison

TEXTS:

1. Enjoying every day English, Published by Sangam Books, Hyderabad
2. Inspiring Speeches and Lives, Published by Maruthi Publications, Guntur



HUM 052	English LanguageII	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course aims to strengthen skills to read engineering workplace documents, such as safety procedures and workshop manuals, in order to perform routine tasks in an engineering workplace setting. By the end of this course, it is expected that the student will be able to:

- Read Engineering workplace documents, such as safety procedures and workshop manuals, in order to perform routine tasks in a workplace setting
- Explain effective professional engineering documents, such as inspection and trip reports, laboratory reports, specifications, progress reports, proposals, instructions, and recommended reports
- communicate visually with PowerPoint and other graphic tools
- communicate effectively with other persons in a workshop or setting including communicating specific technical information

NOTE:

The students will be trained in reading skills using the prescribed text for detailed study.

They will be examined in reading and answering questions using passages which may be taken from Engineering workplace documents such as safety procedures and workshop manuals, inspection and trip reports, laboratory reports, specifications, progress reports, proposals, instructions, and recommendation reports

NARS ATTRIBUTES : 7

Contents

Reading special texts in a variety of formats: workplace standard operating procedures-product manufacturer and component supplier specifications- instructions in workshop manuals- service and repair bulletins- industry codes of practice. Workplace communications: communicating by most appropriate means including face to face, telephone, written or electronic means, speaking clearly, writing legibly, using eye contact and using appropriate body language.

TEXTS:

Texts in: workplace standard operating procedures-product manufacturer and component supplier specifications- instructions in workshop manuals- service and repair bulletins- industry codes of practice

HUM 053	Human Rights	Lecture : 2	Tutorial: 0	Lab: 0
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Specific Goals:

This course examines an aspect of the implementation and development of human rights. The student will be able to:

- Have an understanding of the principles and institutions of national international human rights law, including their origins, assumptions, contents, limits and potential;
- Have an improved ability to think analytically about the implementation and development of international human rights law and to apply this body of law in his own professional and national setting;

NARS ATTRIBUTES: 6, 7

Contents

Historical Background of Human Rights.Philosophical Issues of Human Rights.International agreements of Human Rights.Egyptian Constitution and Human Rights. Egyptian laws of Human Rights. Islam and Human Rights. United Nations agencies for the protection of human rights, national protection of human rights, Case studies on human rights

TEXT(S): None



HUM 054	Health, safety and Risk Assessment	Lecture : 2	Tutorial: 0	Lab: 2
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Specific Goals:

This course develops learner awareness of the principles of health and safety planning and implementation. The student will be able to

LEARNING OUTCOMES

- Select and apply safe working procedures
- Apply current health and safety legislation
- Analyze systems for the assessment of risk
- Apply risk management to life, property and activities

NARS ATTRIBUTES: 8, 10+ (14 energy)

Contents

Principles of health and safety planning and implementation. National and international health and safety legislation. Concepts of risk assessment and its evaluation when applied to any potential hazard. Applications of risk management techniques in the context of risks to life, property and general activities.

REQUIRED TEXT(S)

Health and Safety: Risk Management, Tony Boyle, 2008 | ISBN-10: 0901357413

HUM 151	Technical Writing	Lecture : 2	Tutorial: 0	Lab: 1
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Specific Goals:

This course shows engineering students how to write and speak more effectively and develop the communication skills essential to success in their academic careers and on the job. The course focus specifically on what an engineer needs on a day-to-day basis, providing an "engineering approach" to technical Communication that features practical examples and situations from today's industry. Based on the engineering concept that anything that interferes with efficient communication is "noise," the course shows students how to make their signal-to-noise ratio as high as possible. Such things as grammar errors, typos, poor organization, and fuzzy thinking are treated as noise that needs to be eliminated from the message, so that communication can be as effective and efficient as the engineering ideas it conveys. By the end of this course it is expected that the student will be able to:

- Eliminate the "noise"—grammatical errors, typos, poor organization, and unclear phrasing from your writing
- Create effective professional engineering documents, such as inspection and trip reports, laboratory reports, specifications, progress reports, proposals, instructions, and recommendation reports
- communicate visually with PowerPoint and other graphic tools
- Stand out from the crowd with better application letters and resumes
- Deliver oral presentations and speeches with confidence



- Avoid plagiarism and other ethical pitfalls that engineering writers encounter

NARS ATTRIBUTES: 6, 7,9,10

Contents

Engineers and Writing. Eliminating Sporadic Noise in Engineering Writing.Guidelines for Writing Noise-Free Engineering Documents.Letters, Memoranda, Email, and Other Media for Engineers. . Writing common Engineering Documents.Writing a. Accessing Engineering Information.in Engineering Report.Constructing Engineering Tables and Graphics.Engineering Your Speaking.Writing to Get an Engineering Job.Ethics and Documentation in Engineering Writing.

TEXTS:

A Guide to Writing as an Engineer, 3rd Edition, David Beer, 2009, ISBN-13: 978-0470417010

HUM 353	Macroeconomics	Lecture : 2	Tutorial: 0	Lab: 0
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Specific Goals:

This course is an introduction to the behavioral science of economics which focuses on the aggregate behavior of households, firms and the government. Upon successful completion of the course, the student should be able to

1. Calculate equilibrium national income levels
2. Calculate and use various multipliers
3. Convert nominal values to real values
4. Use a graph to explain the impact of changes in fiscal and/or monetary policy on income and price levels.
5. Use simple models of international trade to study the flow of goods between countries and discuss the costs of protectionism within the context of such models.

NARS ATTRIBUTES: 8, 10, 11

Contents

Introduction to Macroeconomics, an introduction to the concept of equilibrium, National income accounting, the measurement of general movement in prices, building of a successful model of an economy, the economic tools, the supply of money, investmentand GDP, understanding the connection between the money and commodities markets

Texts

Greg Mankiw; Principles of Macroeconomics, 6th Ed, South-Western



HUM 352	Foundations of Management	Lecture : 2	Tutorial: 0	Lab: 0
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Specific Goals:

The primary aim of this course is to provide an overview of the theories and practices of management in organizational contexts. A secondary aim is to provide students with sound knowledge of the organization phenomenon and organizational system processes and trains them for successful fulfilment of their management role

Learning Outcomes

Upon successful completion of the requirements for this course, students will be able to:

1. Demonstrate an understanding of various management models and frameworks, their relevant foundations, strengths and weaknesses;
2. Understand the principles and practices of management, and specifically the nature of management functions, roles and skills;
3. Apply theoretical models and concepts to current management practices, problems and issues; and to use critical reflection to gain deeper understanding of issues;
4. Recognize major environmental and social pressures and challenges facing managers today; and the complex and interdependent nature of managerial work;
5. Write a scholarly essay, drawing on cutting edge contemporary management literature on a selected management topic.

NARS ATTRIBUTES: 5, 6+ (7, 16 energy)

Contents

Foundation concepts in marketing, organizational behavior, human resource, management, management principles, operations management, business policy, and strategy.

Texts

1. Robbins, S.P. & Coulter, Mary (1996) Management; Prentice Hall.
2. Robbins, S.P. & Decenzo, David A. (2001) Fundamentals of Management, Pearson.
3. Decenzo, David A. & Robbins, S.P. (1996) Human Resource Management. John Wiley.



HUM 451	Critical Thinking	Lecture : 2	Tutorial: 0	Lab: 0
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Specific Goals:

This course aims to strengthen critical thinking skills and nurture the courageous desire to seek truth by following reasons and evidence wherever they lead.

NARS ATTRIBUTES: 6,7,8,10,11

Contents

The Power of Critical Thinking. Solve Problems and Succeed in College. Skilled and Eager to Think. Clarify Ideas and Concepts. Analyze Arguments and Diagram Decisions. Evaluate the Credibility of Claims and Sources. Evaluate Arguments: The Four Basic Tests. Evaluate Deductive Reasoning. Spot Deductive Fallacies. Evaluate Inductive Reasoning. Spot Inductive Fallacies. Think Heuristically: Risks and Benefits of Snap Judgments. Think Reflectively: Strategies for Decision Making. Comparative Reasoning. Ideological Reasoning. Empirical Reasoning. Write Sound and Effective Arguments

TEXTS:

THINK Critically by Peter Facione and Carol Ann Gittens. Upper Saddle River, NJ: Pearson, 2nd Edition, 2013, 338 pages. ISBN 13:978-0-205-49098-1.



وزارة التعليم العالي
المعهد العالي للهندسة و تكنولوجيا السيارات و الطاقة بهيليوبليس الجديد

Engineering culture and Business Administration

Course Description



BAS 171	Environmental Management	Lecture : 2	Tutorial: 1	Lab: 0
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Specific Goals:

By the end of this course it is expected that the student will be able:

- Learn the project management process including project selection and evaluation.
- Gain skills in developing a project plan defining the scope, phases, milestones goals, and purposes.
- Learn how to construct a work breakdown structure and create a project task network.

NARS ATTRIBUTES: 8, 10+ (14 energy)

- Consider the impacts of engineering solutions on society & environment.
- Demonstrate knowledge of contemporary engineering issues.
- Display professional and ethical responsibilities; and contextual understanding
- Engage in self- and life- long learning.

Contents

The importance of studying environmental science – modern technology and its effect on the environment – quality of the environment and development elements – sources of environmental pollution and method of control (air pollution – water pollution – solid wastes pollution – noise) – economics of environmental pollution control – legislations for the environment protection

BAS 372	Operation Researches	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

By the end of this course it is expected that the student will be able:

- Learn the project management process including project selection and evaluation.
- Gain skills in developing a project plan defining the scope, phases, milestones goals, and purposes.
- Learn how to construct a work breakdown structure and create a project task network.

NARS ATTRIBUTES : 2,6,7,8,11+(3,6,10 energy)

Contents

Models and methods of operations research in solving engineering and management problems. Linear programming, simplex method, duality, sensitivity analysis; transportation, assignment and transshipment models; network flows models; integer programming

BAS 371	Engineering management	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

By the end of this course it is expected that the student will be able:



- Learn the project management process including project selection and evaluation.
- Gain skills in developing a project plan defining the scope, phases, milestones goals, and purposes.
- Learn how to construct a work breakdown structure and create a project task network.

NARS ATTRIBUTES: 5, 7

Contents

- **Management:** Principles of management theory – The environment of management – planning – individual and group decision making – organizational culture, structure and design of management – motivating employees – leadership – interpersonal and organizational communication – control techniques for enhancing organizational effectiveness – the human relationships and the organizational behavior

BAS 081	Fundamental of marketing	Lecture : 2	Tutorial: 1	Lab: 0
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Specific Goals:

By the end of this course it is expected that the student will be able:

- Learn the project management process including project selection and evaluation.
- Gain skills in developing a project plan defining the scope, phases, milestones goals, and purposes.
- Learn how to construct a work breakdown structure and create a project task network.

NARS ATTRIBUTES: 6,7,11

3- Contents

- Effective market research study - Topics include research design, psychological measurement, survey methods, experimentation and statistical analysis of marketing data. The evolution of markets and marketing - Market structure, marketing cost and efficiency, public and private regulations, the development of marketing programs including decisions involving products, price, promotional distribution.



BAS 281	Project Management	Lecture : 2	Tutorial: 2	Lab: 0
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Specific Goals:

By the end of this course it is expected that the student will be able:

- Learn the project management process including project selection and evaluation.
- Gain skills in developing a project plan defining the scope, phases, milestones goals, and purposes.
- Learn how to construct a work breakdown structure and create a project task network.

NARS ATTRIBUTES: 6,7,8,9,10,11,12

Contents

Understanding Project Management: Functional Work vs. Project Work- Organizing for Project Management Efficiency- Adopting a Project Management Philosophy- Organizational Structures- Functioning Effectively- Setting Up a Project Management System. Defining the Roles of the Project Manager and the Team: The Role of the Project Manager- The Makeup of a Project Manager- Project Manager Relationships and Tools- Responsibility, Accountability, and Authority- Role of Team Members. Defining the Project: Defining the Problem or Opportunity- Establishing Project Objectives- Performing Project Reviews- Creating a Work Breakdown Structure.

TEXTS:

- Successful Project Management, Larry Richman, American Management Assoc. Book included with registration.
- Checking Crank Condition and Engine Balancing
- Use Workplace Technical Documents
- Write Technical Reports

NARS ATTRIBUTES: 9,10,11,13

Contents

Principles of internal combustion engines – Classification of internal combustion engines - The fuel air standard cycle, Deviations between the actual cycle and fuel air standard cycle –fuels Properties – Combustion in spark ignition engine – Combustion chambers of spark ignition engines – Combustion in compression ignition engines – Combustion chambers of compression ignition engines – Performance of internal combustion engines – Engine emissions its control systems - Engine modern trends - Conventional and electronic ignition – fuel supply systems – air supply systems (super charging and turbo charging) .

TEXT: 1. Handbook of Automotive Engineering, Society of Automotive Engineers International, latest edition.