ELECTRONICS AND COMMUNICATIONS ENGINEERING
B. Sc. Program

Status Report: Volume II
December 2009
B. SC. PROGRAM STATUS REPORT

Electronics and Communications Engineering Department

Prepared by Departmental Committee and Coordinated by

Prof. Dr. Darwish Abd El-Aziz

Head of Electronics and Communications Engineering Department

DECEMBER 2009
DEPARTMENT VISION/MISSION STATEMENTS

Vision
The vision of the ECE department is envisaging being amongst the top-ranked correspondents in the world by leading revolutionary research in electronics and communications disciplines while guaranteeing the finest quality educational programs that is able to produce the leaders who will shape the future technological arena worldwide.

Mission
**Pursue** the discovery of fundamental knowledge and its applications through creative, innovative and pioneering research.

**Provide** an outstanding educational program that enables our graduates to become the finest in their profession by imparting fundamental principles, skills, and tools to innovate and excel.

**Develop** within each student a robust repertoire of professional skills, to provide each with avenues for exploring diverse interests, and to launch each successfully into one of a variety of careers offering lifelong learning, service, and leadership within their own local, national and global communities.

**Facilitate** the development of well rounded, educated, productive, and ethical individuals who are well versed in social and environmental issues beside the technology issues.

DEPARTMENT OBJECTIVES

Undergraduate education in the AAST Electronics and Communication Department provides:

- Fundamental knowledge in mathematics, physical sciences, and electrical engineering.
- The opportunity to specialize in specific areas of interest or career aspiration.
- Intensive training in problem solving, laboratory skills, and design skills.
- A well-rounded education that includes communication skills, the ability to function well on a team, an appreciation for ethical behaviour, and the ability to engage in lifelong learning.

This education is meant to prepare our students to thrive and to lead. It also prepares them to achieve our two Program Educational Objectives (PEOs):

**Successful Careers:** Graduates of the program will have successful technical or professional careers.

**Lifelong Learning:** Graduates of the program will continue to learn and to adapt in a world of constantly evolving technology.
# Table of Contents

## I N T R O D U C T I O N
- Electronics and Communications Engineering: An Overview
  - Activities
  - Career Opportunities
  - Program Outcomes

## E X T E R N A L  E X A M I N E R S
- Preparation of Students for Engineering Applications
- Industrial Input and Influence
- Communication Skills
- Engineering Problem Solving Skills
- Sustainability
- Review of Program Objectives
- The Attributes of an Engineer
- Program Intended Learning Outcomes (ILOs)

## P R O G R A M  P L A N N I N G  S H E E T
- Curriculum
- Course Coding
- Degree Offered
- Graduation Requirements
- Academic Program Sheet
- Course Prerequisites
- Academic Program Analysis
- Program Analysis by Semester Offering
- NARS Characterization by Course Group
- Comparison with Previous Program

## C O U R S E S  S U M M A R Y  D E S C R I P T I O N
- EC Department Courses
- Course Group: Solid State Electronics and Measurements
- Course Group: Communications
- Course Group: Electronics
- Course Group: Antennas and Microwaves
- Course Group: Project Courses
- Course Group: Basic & Applied Sciences
- Course Group: Computer Engineering (CC)
- Course Group: Computer Sciences (CC)
- Course Group: Electrical Engineering (EE)
- Course Group: Industrial and Management Engineering (IM)
- Course Group: Language, Humanities and Social Science (LH)

## C O U R S E  F I L E  S U M M A R Y
- Course Group: Mechanical Engineering (ME)
- Course Group: Non-Engineering (NE)

## T E A C H I N G  F A C U L T Y  L I S T
- Full Time Staff
- Part Time Staff
- Assistants

## D E P A R T M E N T  F A C I L I T I E S
- Experimental Facilities Supporting the Program
- Solid State Electronics Lab
- Electronic Circuits Lab
- Electronic Devices Lab
- Gmdss - Vlsi Lab
- Digital Communication Lab
- Analog Communication Lab
- Fiber Optics and Acoustics Lab
- Marine Radar Lab
- Antenna and Microwave Lab
- Electrical Circuits Lab
- Microprocessor Laboratory
- Digital Circuits Laboratory
- Digital Automatic Control Laboratory
- Analogue Automatic Control Laboratory
- Computer Laboratory
- Physics Laboratory I
- Physics Laboratory II
- Chemistry Laboratory
Introduction

Program overview, activities and job opportunities, and program objectives

Electronics and Communications Engineering: An Overview

The department of Electronics and Communications Engineering was established in 1987. It offers the Bachelor of Science degree in the area of Electronics and Communication engineering. The Bachelor of Science program requires 180 credit hours for completion of the degree.

Electronics and Communications Engineering is a broad professional discipline concerned with the analysis, design and management of signal generators, electronic circuitry, voice, data and video systems, antennas, and electromagnetic wave propagation.

The complexity of modern industrial and service organizations with their emphasis on quality, increased effectiveness and higher productivity through automation and computerization has led to an increased demand for a new breed of electronics and communications engineering graduates.

Activities

To obtain a B.Sc. in Electronics and Communications Engineering, students must successfully complete 180 credit hours. The normal duration of study is 10 semesters (5 years). The first two semesters are common to all engineering students. Specialization starts from the 3rd semester. Semesters 3 to 8 are common to all students majoring in Electronics and Communications Engineering. In the 9th semester students may opt for either Electronics or Communications. This branch specialization extends to 10th semester as well. In these final semesters students select three courses in their chosen branch specialization plus two courses from the other branch. All final year students are required to complete an engineering applications project in their chosen specialization branch. The project extends over the last two semesters.

Career Opportunities

Quick survey of engineering job vacancies at the daily newspaper reveals that Electronics and Communications Engineering would collect almost 40% of the total engineering opportunities available. In fact Electronics and Communications Engineering department main objectives are to introduce a qualified engineer to serve in the field of:

- Wireless Communications.
- Biomedical Engineering.
- Analogue or Digital Signal Processing based systems.
- Automated industrial systems where computer controlled systems are used.
- Mobile Communication Systems.
- Microcontrollers and Embedded Systems.
- Antennas and Wave Propagation Applications.

**Program Outcomes**

Students graduating from the Electronics and Communication Department at AAST will be expected and prepared to exercise the skills and abilities that are listed below. The list also indicates how the Program Outcomes contribute to the Program Educational Objectives.

- Ability to apply knowledge of mathematics, science, and engineering.
- Ability to design and conduct experiments, as well as to analyze and interpret data.
- Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- Ability to function on multi-disciplinary teams.
- Ability to identify, formulates, and solves engineering problems.
- Understanding of professional and ethical responsibility.
- Ability to communicate effectively.
- Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- Recognition of the need for, and an ability to engage in life-long learning.
- Knowledge of contemporary issues.
- Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Knowledge of probability and statistics, including applications to electrical engineering.

- Knowledge of mathematics through differential and integral calculus, and basic science, computer science, and engineering sciences, necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to electrical engineering.

**External Examiners**

The college of engineering and technology has nominated external examiners to carry out the evaluation of the final exams at the end of each semester, with special focus on the width and depth of the course content, engineering applications and interpreting mathematical models in education according to a check list of evaluation.

**Preparation of Students for Engineering Applications**

The connection between the educational studies and industry is very important. The college of engineering and technology provides the chance for the students to experience the practical training starting from 6th semester before which the training would not be useful because the student yet
don’t have enough knowledge. The college contacts industrial institutes, factories and companies all over the country to arrange for sending out students to have at least three weeks of practical training there. The college also offers the chance for the distinction students to perform practical training overseas. The college also accepts if the students do the training on their own by personal connections, with industry. This is useful especially for students who have to live with their parents over summer in Arab countries. All students should submit a report about the training course to their department, present a seminar and have a discussion with the department staff about it. The practical training is done twice and they are credible courses through the evaluation of the engineering project. Below is a list of some of the industrial factories and companies in which training is carried out by students:

- Elmasriah for Telecommunications Co.
- Nile Sat.
- Elmasriah for Petrochemicals Co. (SIDPEC)
- Abou-Qir for Fertilizers.
- Suez Gulf [JABCO].
- Egyptian Natural Gas Co. (GASCO).
- Sumed.
- BANHA for Electronics.
- Electricity Company [Eltarah]
- Sherier & Technofar Co.

**Industrial Input and Influence**

The department arranges some visits throughout the year for students to visit some factories and many other industrial environments. The visits are important as they allow students to be familiar with the topics being presented in their courses and know how these topics relate to practical industrial environments. Below is a list of some of the visits conducted for students.

- BAHGAT Factories - Cairo.
- ELMADIEE Satellite Station - Cairo.

**Communication Skills**

The oral skills are developed through the lab contact hours, where in some courses there are lab reports that have to be presented to the instructor orally. In Technical Report Writing Course (LH 231) the students are practicing the oral presentation. In the final year, students must give an oral presentation for their graduation project.

**Engineering Problem Solving Skills**

Through most courses, the students practice to solve problems by themselves or using a computer program. Quizzes, the 7th, the 12th and the final exams are basically based on solving problems. Some problems based on practical situations are introduced to the students to improve their practical thinking particularly through the last two terms.
**Sustainability**

The department undergraduate courses are designed and updated on yearly basis to cover technological advances in various fields of electronics and communications engineering. The department provides graduate subject-oriented courses and studies (diploma and master) for graduates. These courses are updated according to the needs of industry and work environment. The aforementioned procedures assure the sustainability of the department graduates in their jobs and satisfy the needs of the ever-changing work place.

**Review of Program Objectives**

One of the ways of insuring that the program objectives are being fulfilled is by continuous observing of the following:

- **Staff performance**: Each lecturer (full time and part time as well) is evaluated according to a lecturer assessment sheet which contains areas for evaluating his performance. The evaluation depends on several inputs including the students’ feedback and the program manager opinion based on the students’ statistics analysis. Furthermore, the participation of the full time staff members in the department’s administrative activities, social activities and scientific activities (published papers and attended conferences) are assessed by the program manager.

- **Course review sheet for each course**: The course review sheet contains areas for comments on course aim and objective, performance, text books and references, tutorial and laboratory, rooms and computer usage…etc. It also contains a field to insert any recommendations for any changes in the course file summaries.

- **Program performance indicator**: This sheet is filled out by the end of each semester. The program performance indicator is divided into fields and each sheet contains data of the past years for the number of students, number of transferred students, number of part time and full time lecturers, student feedback on course, books, instructors, laboratories, number of student appeals and complaints.

**The Attributes of an Engineer**

- An ability to apply knowledge of mathematics, science and engineering concepts to the solution of complex engineering problems
- An ability to design and conduct experiments and to analyze and interpret data
- An ability to design a system, component or process to meet required needs
- An ability to function within multi-disciplinary teams
- An ability to identify, formulate and solve engineering problems
- An understanding of professional and ethical responsibilities
- An ability to communicate effectively
- An ability to consider and avoid the detrimental impact of engineering solutions within social or global measures
- An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
Program Intended Learning Outcomes (ILOs)

Knowledge and Understanding
On successful completion of the programs, graduates must be able to demonstrate knowledge and understanding of

a) Basics of mathematical techniques to help model, analyze, and optimize systems;
b) Elementary science underlying electronic engineering systems and information technology;
c) Basics of design and analyzing electronic engineering systems, while considering the constraints of applying inappropriate technology and the needs of commercial risk evaluation;
d) Managing and practicing business, including finance, law, marketing and quality control;
e) The professional and ethical responsibilities of engineer;
f) Analysis, design and synthesis of electronic circuits and components;
g) Analysis and design of control systems with performance evaluation;
h) Biomedical electronics and instrumentation;
i) A range of programming languages and environments;
j) Broad lines of industrial process engineering and control;
k) Communication systems (transmitters receivers, quantization noise and companding);
l) Coding and decoding techniques;
m) Microwave techniques and applications;
n) Antenna and wave propagation;
o) Nanotechnology applications;
p) Usage of optical fiber in communication systems;
q) Methods of fabrication of Integrated circuits;
r) Analysis of signal processing
s) Optical communication systems

Intellectual Skills
On Successful completion of the program, graduates must be able to:

a) Select and apply appropriate scientific principles, mathematical and computer-based methods for analyzing electronic and communication systems.
b) Initiate creative thinking for resolving and developing innovative solutions for practical industrial problems.
c) Organize tasks into a structured form.
d) Understand the evolving state of knowledge in a rapidly developing area.
e) Transfer appropriate knowledge and methods from one topic to another.
f) Plan, conduct and write a report on a project or assignment.
g) Prepare an oral presentation.
h) Approach the suitable tools for solving problems to tackle any practical problem in the electronics and communication fields.
i) Analyze, interpret, and explain data and design experiments to obtain new data
j) Develop computer programs.
k) Select and apply appropriate IT tools to a verity of engineering problems.

Practical Skills
On Successful completion of the program, graduates must be able to:

a) Use appropriate mathematical methods or IT tools.
b) Program a computer to solve problems.

c) Use relevant laboratory equipment and analyze the results correctly.

d) Troubleshoot, maintain and repair almost all types of electronic and communication systems using the standard tools.

e) Synthesis and integrate electronic systems for certain specific function using the right equipment.

f) Design, build, interface, and test systems and minimize sources of errors.

g) Explain appropriate specifications for required devices.

h) Use appropriate tools to measure system performance.

i) Program a computer to solve problems.

j) Utilize project management methods.

k) Present work both in written and oral form.

**General Skills**
The engineer must have the ability to:

a) Apply knowledge of mathematics, science and engineering concepts to solve engineering problems.

b) Identify, formulate and solve engineering problems

c) Exploit the techniques, skills and up-to-date engineering tools, necessary for engineering practice

d) Design a system, component and process to meet the required needs within realistic constraints

e) Consider the detrimental impact of engineering solutions on society and environment

f) Design and conduct experiments and analyze and interpret data

g) Demonstrate knowledge of contemporary engineering issues

h) Work efficiently within multi-disciplinary teams

i) Display professional responsibilities and ethical, societal and cultural concerns

j) Communicate effectively with others

k) Recognize the need to engage in self- and life-long learning

l) Manage engineering projects subjected to economic, environmental and social constraints.

m) Fulfil requirements of potential employers.

**Attitude**

a) Interest in courses Materials, Subjects and Teaching Aids.

b) Display a sense of curiosity for learning, Exploration and investigation.

c) Practice Personal responsibility.

d) Demonstrate persistence in completing tasks a Varity of resources to topic investigation.

e) Sharing knowledge with others.

f) Demonstrate appropriate Behaviour.

g) Function positively.

h) Participate with others effectively

i) Respect differences in others

j) Generosity to charities

k) Satisfaction to the program and courses.

l) Time Abidance.
Program Planning Sheet

New program structure including the suggested new course titles and codes and comparison between this program and the previous one

Curriculum

The program curriculum provides a thorough grounding in both scientific and engineering aspects by offering courses in mathematics, physics, chemistry, computer and the engineering sciences accompanied by a rich spectrum of engineering courses.

Core engineering courses focus on fundamental knowledge in electronics and communications engineering. Core electronics engineering courses cover a wide area of knowledge. It extends from the operation of basic electronic devices going through the analysis and design of electronic amplifiers, studying the fundamentals of analogue and digital microelectronic circuits in addition to different types of ADC’s and DAC’s and pursuing to the design and performance analysis of analogue and digital filters. In core communication engineering courses, analogue and digital communication systems adopting different modulation and multiplexing techniques together with the performance of these systems under the effect of noise shall be studied.

Moreover, core engineering courses cover the basic principles of solid state electronics, the properties of different electronic materials, the fundamentals of electrical and electronic measurements, electromagnetic wave theory, fundamentals of EM propagation and transmitting media and performance analysis and design of various types of antennas.

Electronics and communications engineering plays a vital role in every sector of society and industry. Thus, the department has carried the responsibility to provide the essential foundation for a variety of specialized technical areas. In addition to the core engineering courses, an important aspect of the electronics and communication engineering program curriculum is the final-year elective courses. Technical electives provide opportunities for broadening or deepening technical knowledge according to student interests and competencies the disciplines of electronics, communications and advanced antenna systems.

Course Coding

Numbering System
The course code consists of five alphanumeric digits; MN XYZ.

- The MN digits: Represent the abbreviations of the subject field.
The X digit: Represents the course level or the year at which the course is offered in the plan of study.

The Y digit: Represents the course group.

The Z digit: Represents the course sequence number within the group.

Abbreviations of Subject Fields

The following abbreviations of subject fields are used in the Degree offered and Graduation Requirements and Course Summary Description sections of this report; and are listed below in an alphabetical order:

- BA – Basic and Applied Science.
- CC – Computer Engineering Dept., College of Computer Science.
- EC – Electronics and Communications Engineering
- EE – Electrical Engineering.
- LH – Language, Humanities and Social Science.
- IM – Industrial and Management Engineering.
- ME – Mechanical Engineering.
- MM – Marine Engineering
- NE – Non-Engineering Courses.

Electronics and Communications Engineering Subject Field Groups

The Electronics and Communications subject field offers courses in the following four groups:

- Solid State Electronics & Measurement Courses (ECX1X)
- Communication Courses. (ECX2X and ECX5X for some Electives)
- Electronics Courses. (ECX3X and ECX6X for some Electives)
- Electromagnetic & Antenna Courses. (ECX4X)

Degree Offered

The program offers the degree of Bachelor of Science (B. Sc.) in Electronics and Communications Engineering. The candidate for the (B. Sc.) degree is required to pursue scholastic quality and complete a plan of study prepared with his academic advisor and approved by the Electronics and Communications Engineering Department Council. The number of credit hours required for graduation is 180 (cr. hr.) spreading over 10 academic semesters. The program contains a sequence of courses that are designed according to the National Academic Reference Standards (NARS) for electronics and communications engineering.
Graduation Requirements

College Requirements

A total of 93 credit hours are required by the college as per the following table:

<table>
<thead>
<tr>
<th>Subject Field</th>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Cr. Hr.</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BA</strong></td>
<td>1</td>
<td>BA 113</td>
<td>Physics (1)</td>
<td>3</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>BA 114</td>
<td>Physics (2)</td>
<td>3</td>
<td>BA 113</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>BA 118</td>
<td>Chemistry</td>
<td>2</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>BA 123</td>
<td>Mathematics (1)</td>
<td>3</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>BA 124</td>
<td>Mathematics (2)</td>
<td>3</td>
<td>BA 123</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>BA 141</td>
<td>Engineering Mechanics (1)</td>
<td>3</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>BA 142</td>
<td>Engineering Mechanics (2)</td>
<td>3</td>
<td>BA 141</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>BA 223</td>
<td>Mathematics (3)</td>
<td>3</td>
<td>BA 124</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>BA 224</td>
<td>Mathematics (4)</td>
<td>3</td>
<td>BA 223</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>BA 323</td>
<td>Mathematics (5)</td>
<td>3</td>
<td>BA 224</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>BA 326</td>
<td>Mathematics (6)</td>
<td>3</td>
<td>BA 124</td>
</tr>
<tr>
<td><strong>CC</strong></td>
<td>1</td>
<td>CC111</td>
<td>Introduction to Computer</td>
<td>3</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>CC112</td>
<td>Structured Programming</td>
<td>3</td>
<td>CC111</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>CC213</td>
<td>Programming Applications</td>
<td>3</td>
<td>CC112</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>CC216</td>
<td>Digital Logic Design</td>
<td>3</td>
<td>CC111</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>CC312</td>
<td>Computer Organization</td>
<td>3</td>
<td>CC216</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>CC413</td>
<td>Numerical Analysis</td>
<td>3</td>
<td>BA224, CC112</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>CC411</td>
<td>Introduction To Microprocessor</td>
<td>3</td>
<td>CC312 or CC216</td>
</tr>
<tr>
<td><strong>EE</strong></td>
<td>3</td>
<td>EE231</td>
<td>Electrical Circuits 1</td>
<td>3</td>
<td>BA124</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>EE232</td>
<td>Electrical Circuits 2</td>
<td>3</td>
<td>EE231</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>EE328</td>
<td>Electrical Power And Machines</td>
<td>3</td>
<td>EE232</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>EE418</td>
<td>Automatic Control Systems</td>
<td>3</td>
<td>EE328</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>EE419</td>
<td>Modern Control Engineering</td>
<td>3</td>
<td>EE418</td>
</tr>
<tr>
<td><strong>IM</strong></td>
<td>1</td>
<td>IM111</td>
<td>Industrial Relations</td>
<td>2</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>IM112</td>
<td>Manufacturing Technology</td>
<td>2</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>IM423</td>
<td>Operations Research</td>
<td>3</td>
<td>IM111</td>
</tr>
<tr>
<td><strong>LH</strong></td>
<td>1</td>
<td>LH 131</td>
<td>English for Special Purposes (1)</td>
<td>2</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>LH 132</td>
<td>English for Special Purposes (2)</td>
<td>2</td>
<td>LH 131</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>LH 231</td>
<td>English for Special Purposes (3)</td>
<td>3</td>
<td>LH 132</td>
</tr>
<tr>
<td><strong>ME</strong></td>
<td>1</td>
<td>ME 151</td>
<td>Eng. Drawing and Projection</td>
<td>2</td>
<td>None</td>
</tr>
<tr>
<td><strong>NE</strong></td>
<td>5</td>
<td>NE 264</td>
<td>Scientific Thinking</td>
<td>3</td>
<td>54 Cr. Hr.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>NE 365</td>
<td>Aesthetic &amp; Art Apprecation</td>
<td>3</td>
<td>NE 364</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>NE364</td>
<td>Engineering Economy</td>
<td>3</td>
<td>LH231</td>
</tr>
</tbody>
</table>
Department Requirements
A total of 87 credit hours are required by the department, which are distributed as follows:

- 72 credit hours of compulsory courses.
- 15 credit hours of elective courses.

The required compulsory and elective courses are listed in the following table.

<table>
<thead>
<tr>
<th>Subject Field</th>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Cr. Hr.</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>3</td>
<td>EC210</td>
<td>Solid State Electronics</td>
<td>3</td>
<td>BA114</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>EC217</td>
<td>Measurements &amp; Instrumentation</td>
<td>3</td>
<td>EE231</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>EC311</td>
<td>Electronic Materials</td>
<td>3</td>
<td>BA114</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>EC410</td>
<td>Electronic Measurements</td>
<td>3</td>
<td>BA114, BA224, BA231</td>
</tr>
<tr>
<td>Group 2</td>
<td>5</td>
<td>EC321</td>
<td>Signals and Systems</td>
<td>3</td>
<td>BA224, EE231</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>EC322</td>
<td>Introduction to Communication Systems</td>
<td>3</td>
<td>BA322, EC321</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>EC421</td>
<td>Statistical Communication Theory</td>
<td>3</td>
<td>BA322, BA326</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>EC422</td>
<td>Introduction to Digital Communications</td>
<td>3</td>
<td>BA421</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>EC523</td>
<td>Advanced Communication Systems</td>
<td>3</td>
<td>BA422</td>
</tr>
<tr>
<td>Group 3</td>
<td>4</td>
<td>EC233</td>
<td>Electronic Devices 1</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>EC332</td>
<td>Electronic Devices 2</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>EC333</td>
<td>Electronic Amplifiers</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>EC334</td>
<td>Analog and Digital Circuit Analysis</td>
<td>3</td>
<td>EE232</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>EC432</td>
<td>Microelectronic Circuits</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>EC434</td>
<td>Analog Signal Processing</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>EC533</td>
<td>Digital Signal Processing</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
<tr>
<td>Group 4</td>
<td>6</td>
<td>EC341</td>
<td>Electromagnetics</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>EC442</td>
<td>Electromagnetics Wave Propagation</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>EC443</td>
<td>Electromagnetics Transmitting Media</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>EC544</td>
<td>Antenna Engineering</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>EC546</td>
<td>Microwave Technology</td>
<td>3</td>
<td>BA114, BA224</td>
</tr>
</tbody>
</table>

- Group 1: Solid State Electronics Courses
- Group 2: Communications Courses
- Group 3: Electronics Courses
- Group 4: Electromagnetics and Antennas Courses
### Department Electives
A total of 15 Cr. Hr. of the following elective courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Cr. Hr.</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 – 10</td>
<td>EC530 Micro-Electromechanical Systems MEMS</td>
<td>3</td>
<td>EC434</td>
</tr>
<tr>
<td>9 – 10</td>
<td>EC535 Digital VLSI Design</td>
<td>3</td>
<td>EC432, CC216</td>
</tr>
<tr>
<td>9 – 10</td>
<td>EC536 VLSI Fabrication &amp; Testing</td>
<td>3</td>
<td>EC535</td>
</tr>
<tr>
<td>9 – 10</td>
<td>EC537 Biomedical Electronics</td>
<td>3</td>
<td>EC434</td>
</tr>
<tr>
<td>9 – 10</td>
<td>EC538 Selected Topics in Electronics</td>
<td>3</td>
<td>EC434</td>
</tr>
<tr>
<td>9 – 10</td>
<td>EC539 Opto Electronics</td>
<td>3</td>
<td>EC233</td>
</tr>
<tr>
<td>9 – 10</td>
<td>EC560 Modern Electronic Circuits</td>
<td>3</td>
<td>EC434</td>
</tr>
</tbody>
</table>

#### Group 1: Communications Courses
- 9 – 10 EC520 Satellite Communications
- 9 – 10 EC521 Communication Networks
- 9 – 10 EC522 Acoustics
- 9 – 10 EC524 Optical Communications
- 9 – 10 EC525 Information Theory & Coding
- 9 – 10 EC526 Mobile Communications
- 9 – 10 EC527 Applied Telecommunication Systems
- 9 – 10 EC528 Data Communication
- 9 – 10 EC529 Modern wireless Communications
- 9 – 10 EC550 Selected Topics in Communications
- 9 – 10 EC551 Telecommunication Systems Engineering
- 9 – 10 EC553 Media & Entertainment Engineering

#### Group 2: Electronics
- 9 – 10 EC545 Advanced Antennas Systems

#### Group 3: Electromagnetics and Antennas Courses
- 9 – 10 CC524 Neural Networks
- 9 – 10 CC527 Computer Aided Design
- 9 – 10 EE512 Automated Industrial Systems (1)
- 9 – 10 IM535 International Operations Management

- Group 1: Communications Courses
- Group 2: Electronics
- Group 3: Electromagnetics and Antennas Courses
## Academic Program Sheet

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LH131</td>
<td>ESP (1)</td>
<td>LH132</td>
</tr>
<tr>
<td>BA123</td>
<td>Mathematics(1)</td>
<td>BA124</td>
</tr>
<tr>
<td>BA113</td>
<td>Physics (1)</td>
<td>BA114</td>
</tr>
<tr>
<td>CC111</td>
<td>Introduction to Computers</td>
<td>CC112</td>
</tr>
<tr>
<td>ME 151</td>
<td>Engineering Drawing &amp; Projection</td>
<td>IM112</td>
</tr>
<tr>
<td>B'A141</td>
<td>Engineering Mechanics (1)</td>
<td>BA142</td>
</tr>
<tr>
<td>IM111</td>
<td>Industrial Relations</td>
<td>BA118</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Semester 3</th>
<th>Semester 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>LH231</td>
<td>ESP (3)</td>
<td>BA224</td>
</tr>
<tr>
<td>BA223</td>
<td>Mathematics (3)</td>
<td>NE264</td>
</tr>
<tr>
<td>EC210</td>
<td>Solid State Electronics</td>
<td>EC233</td>
</tr>
<tr>
<td>CC213</td>
<td>Programming Applications</td>
<td>EC217</td>
</tr>
<tr>
<td>NE465</td>
<td>Aesthetic Edu &amp; Art Appreciation</td>
<td>CC216</td>
</tr>
<tr>
<td>EE231</td>
<td>Electrical Circuits (1)</td>
<td>EE232</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Semester 5</th>
<th>Semester 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA323</td>
<td>Mathematics (5)</td>
<td>BA326</td>
</tr>
<tr>
<td>EE328</td>
<td>Electrical Power &amp; Machines</td>
<td>EC333</td>
</tr>
<tr>
<td>EC334</td>
<td>Analog and Digital–Circuits Analysis</td>
<td>EC341</td>
</tr>
<tr>
<td>CC312</td>
<td>Computer Organization</td>
<td>CC413</td>
</tr>
<tr>
<td>EC332</td>
<td>Electronic Devices (2)</td>
<td>EC322</td>
</tr>
<tr>
<td>EC321</td>
<td>Signals and Systems</td>
<td>EC311</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Semester 7</th>
<th>Semester 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC432</td>
<td>Microelectronic Circuits</td>
<td>EC434</td>
</tr>
<tr>
<td>EC421</td>
<td>Statistical Communication Theory</td>
<td>EC422</td>
</tr>
<tr>
<td>EC442</td>
<td>Electromagnetic Wave Propagation</td>
<td>EC443</td>
</tr>
<tr>
<td>CC411</td>
<td>Introduction to Microprocessors</td>
<td>NE364</td>
</tr>
<tr>
<td>IM423</td>
<td>Operation Research</td>
<td>EE419</td>
</tr>
<tr>
<td>EE418</td>
<td>Automatic Control Systems</td>
<td>EC410</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IM400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th>Semester 9</th>
<th>Semester 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC544</td>
<td>Antennas Engineering</td>
<td>EC546</td>
</tr>
<tr>
<td>EC523</td>
<td>Advanced Communication Systems</td>
<td>EC533</td>
</tr>
<tr>
<td>EC501</td>
<td>Project (1)</td>
<td>EC503</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
<td>*</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
<td>*</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
<td>*</td>
</tr>
<tr>
<td>Available Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Group A: Electronics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC530</td>
<td>Micro-Electromechanical Systems MEMS</td>
<td></td>
</tr>
<tr>
<td>EC535</td>
<td>Digital VLSI Design</td>
<td></td>
</tr>
<tr>
<td>EC536</td>
<td>VLSI Fabrication &amp; Testing</td>
<td></td>
</tr>
<tr>
<td>EC537</td>
<td>Biomedical Electronics</td>
<td></td>
</tr>
<tr>
<td>EC538</td>
<td>Selected Topics in Electronics</td>
<td></td>
</tr>
<tr>
<td>EC539</td>
<td>Opto Electronics</td>
<td></td>
</tr>
<tr>
<td>EC560</td>
<td>Modern Electronic Circuits</td>
<td></td>
</tr>
<tr>
<td><strong>Group B: Communications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC520</td>
<td>Satellite Communications</td>
<td></td>
</tr>
<tr>
<td>EC521</td>
<td>Communication Networks</td>
<td></td>
</tr>
<tr>
<td>EC522</td>
<td>Acoustics</td>
<td></td>
</tr>
<tr>
<td>EC524</td>
<td>Optical Communications</td>
<td></td>
</tr>
<tr>
<td>EC525</td>
<td>Information Theory &amp; Coding</td>
<td></td>
</tr>
<tr>
<td>EC526</td>
<td>Mobile Communications</td>
<td></td>
</tr>
<tr>
<td>EC527</td>
<td>Applied Telecommunication Systems</td>
<td></td>
</tr>
<tr>
<td>EC528</td>
<td>Data Communication</td>
<td></td>
</tr>
<tr>
<td>EC529</td>
<td>Modern wireless Communications</td>
<td></td>
</tr>
<tr>
<td>EC550</td>
<td>Selected Topics in Communications</td>
<td></td>
</tr>
<tr>
<td>EC551</td>
<td>Telecommunication Systems Engineering</td>
<td></td>
</tr>
<tr>
<td>EC553</td>
<td>Media &amp; Entertainment Engineering</td>
<td></td>
</tr>
<tr>
<td><strong>Group C: Electromagnetics and Antennas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC545</td>
<td>Advanced Antennas Systems</td>
<td></td>
</tr>
<tr>
<td><strong>Group D: From Other Departments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC524</td>
<td>Neural Networks</td>
<td></td>
</tr>
<tr>
<td>CC527</td>
<td>Computer Aided-Design</td>
<td></td>
</tr>
<tr>
<td>IM535</td>
<td>International Operation Management</td>
<td></td>
</tr>
<tr>
<td>EE512</td>
<td>Automated Industrial Systems 1</td>
<td></td>
</tr>
</tbody>
</table>
## Course Prerequisites

### Prerequisites List - Core Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEMESTER 1</strong></td>
<td></td>
</tr>
<tr>
<td>LH131 ESP (1)</td>
<td>None</td>
</tr>
<tr>
<td>BA123 Mathematics(1)</td>
<td>None</td>
</tr>
<tr>
<td>BA113 Physics (1)</td>
<td>None</td>
</tr>
<tr>
<td>CC111 Introduction to Computers</td>
<td>None</td>
</tr>
<tr>
<td>ME 151 Engineering Drawing &amp; Projection</td>
<td>None</td>
</tr>
<tr>
<td>BA141 Engineering Mechanics (1)</td>
<td>None</td>
</tr>
<tr>
<td>IM111 Industrial Relations</td>
<td>None</td>
</tr>
<tr>
<td><strong>SEMESTER 2</strong></td>
<td></td>
</tr>
<tr>
<td>LH132 ESP (2)</td>
<td>LH131 ESP (1)</td>
</tr>
<tr>
<td>BA124 Mathematics(2)</td>
<td>BA123 Mathematics(1)</td>
</tr>
<tr>
<td>BA114 Physics (2)</td>
<td>BA113 Physics (1)</td>
</tr>
<tr>
<td>CC112 Structured Programming</td>
<td>CC111 Introduction to Computers</td>
</tr>
<tr>
<td>IM112 Manufacturing Technology</td>
<td>None</td>
</tr>
<tr>
<td>BA142 Engineering Mechanics (2)</td>
<td>BA141 Engineering Mechanics (1)</td>
</tr>
<tr>
<td>BA118 Chemistry</td>
<td>None</td>
</tr>
<tr>
<td><strong>SEMESTER 3</strong></td>
<td></td>
</tr>
<tr>
<td>LH231 ESP (3)</td>
<td>LH132 ESP (2)</td>
</tr>
<tr>
<td>BA223 Mathematics (3)</td>
<td>BA124 Mathematics(2)</td>
</tr>
<tr>
<td>EC210 Solid State Electronics</td>
<td>BA114 Physics (2)</td>
</tr>
<tr>
<td>CC213 Programming Applications</td>
<td>CC112 Structured Programming</td>
</tr>
<tr>
<td>NE465 Aesthetic Edu &amp; Art Appreciation</td>
<td>None</td>
</tr>
<tr>
<td>EE231 Electrical Circuits (1)</td>
<td>BA124 Mathematics(2)</td>
</tr>
<tr>
<td><strong>SEMESTER 4</strong></td>
<td></td>
</tr>
<tr>
<td>BA224 Mathematics (4)</td>
<td>BA223 Mathematics (3)</td>
</tr>
<tr>
<td>NE264 Scientific Thinking</td>
<td>LH231 ESP (3)</td>
</tr>
<tr>
<td>EC233 Electronic Devices (1)</td>
<td>EC210 Solid State Electronics</td>
</tr>
<tr>
<td>EC217 Measurements &amp; Instrumentation</td>
<td>EE231 Electrical Circuits (1)</td>
</tr>
<tr>
<td>CC216 Digital Logic Design</td>
<td>CC111 Introduction to Computers</td>
</tr>
<tr>
<td>EE232 Electrical Circuits (2)</td>
<td>EE231 Electrical Circuits (1)</td>
</tr>
<tr>
<td>Course</td>
<td>Prerequisite</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td><strong>SEMESTER 5</strong></td>
<td></td>
</tr>
<tr>
<td>BA323 Mathematics (5)</td>
<td>BA224 Mathematics (4)</td>
</tr>
<tr>
<td>EE328 Electrical Power &amp; Machines</td>
<td>EE232 Electrical Circuits (2)</td>
</tr>
<tr>
<td>EC334 Analog and Digital – Circuits Analysis</td>
<td>EE232 Electrical Circuits (2)</td>
</tr>
<tr>
<td>CC312 Computer Organization</td>
<td>CC216 Digital Logic Design</td>
</tr>
<tr>
<td>EC332 Electronic Devices (2)</td>
<td>EC233 Electronic Devices (1), EE232 Electrical Circuits (2)</td>
</tr>
<tr>
<td>EC321 Signals and Systems</td>
<td>BA224 Mathematics (4), EE231 Electrical Circuits (1)</td>
</tr>
<tr>
<td><strong>SEMESTER 6</strong></td>
<td></td>
</tr>
<tr>
<td>BA326 Mathematics (6)</td>
<td>BA224 Mathematics (4)</td>
</tr>
<tr>
<td>EC333 Electronic Amplifiers</td>
<td>EC322 Electronic Devices (2), BA226 Measurements &amp; Instrumentation</td>
</tr>
<tr>
<td>EC341 Electromagnetics</td>
<td>BA114 Physics (2), BA224 Mathematics (4)</td>
</tr>
<tr>
<td>EC322 Introduction to Communication Systems</td>
<td>BA323 Electronic Devices (2), EC311 Signals and Systems</td>
</tr>
<tr>
<td>CC413 Numerical Analysis</td>
<td>BA224 Mathematics (4), CC112 Structured Programming</td>
</tr>
<tr>
<td>EC311 Electronic Materials</td>
<td>EC210 Solid State Electronics</td>
</tr>
<tr>
<td><strong>SEMESTER 7</strong></td>
<td></td>
</tr>
<tr>
<td>EC432 Microelectronic Circuits</td>
<td>EC333 Electronic Amplifiers</td>
</tr>
<tr>
<td>EC421 Statistical Communication Theory</td>
<td>EC322 Introduction to Communication Systems, BA326 Mathematics (6)</td>
</tr>
<tr>
<td>EC442 Electromagnetic Wave Propagation</td>
<td>EC341 Electromagnetics</td>
</tr>
<tr>
<td>CC411 Introduction to Microprocessors</td>
<td>CC312 Computer Organization</td>
</tr>
<tr>
<td>IM423 Operation Research</td>
<td>IM111 Industrial Relations</td>
</tr>
<tr>
<td>EE418 Automatic Control Systems</td>
<td>EE328 Electrical Power &amp; Machines</td>
</tr>
<tr>
<td><strong>SEMESTER 8</strong></td>
<td></td>
</tr>
<tr>
<td>EC434 Analog Signal Processing</td>
<td>EC432 Microelectronic Circuits</td>
</tr>
<tr>
<td>EC422 Introduction to Digital Communications</td>
<td>EC421 Statistical Communication Theory</td>
</tr>
<tr>
<td>EC443 Electromagnetic Transmitting Media</td>
<td>EC442 Electromagnetic Wave Propagation</td>
</tr>
<tr>
<td>NE364 Engineering Economy</td>
<td>LH231 ESP (3)</td>
</tr>
<tr>
<td>EE419 Modern Control Engineering</td>
<td>EE418 Automatic Control Systems</td>
</tr>
<tr>
<td>EC410 Electronic Measurements</td>
<td>EC432 Microelectronic Circuits</td>
</tr>
<tr>
<td>IM400 Practical Training</td>
<td>None</td>
</tr>
<tr>
<td>Course</td>
<td>Prerequisite</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td><strong>SEMESTER 9</strong></td>
<td></td>
</tr>
<tr>
<td>EC544</td>
<td>Antennas Engineering</td>
</tr>
<tr>
<td>EC523</td>
<td>Advanced Communication Systems</td>
</tr>
<tr>
<td>EC501</td>
<td>Project (1)</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
</tr>
<tr>
<td><strong>SEMESTER 10</strong></td>
<td></td>
</tr>
<tr>
<td>EC546</td>
<td>Microwave Technology</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>EC533</td>
<td>Digital Signal Processing</td>
</tr>
<tr>
<td>EC503</td>
<td>Project (2)</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
</tr>
</tbody>
</table>
### Prerequisites List – Elective Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Department Electives</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Group 1: Electronics</strong></td>
<td></td>
</tr>
<tr>
<td>EC530 Micro-Electromechanical Systems MEMS</td>
<td>EC434 Analog Signal Processing</td>
</tr>
<tr>
<td>EC535 Digital VLSI Design</td>
<td>EC432 Microelectronic Circuits, Digital Logic Design</td>
</tr>
<tr>
<td>EC536 VLSI Fabrication &amp; Testing</td>
<td>CC216</td>
</tr>
<tr>
<td>EC537 Biomedical Electronics</td>
<td>EC434 Analog Signal Processing</td>
</tr>
<tr>
<td>EC538 Selected Topics in Electronics</td>
<td>EC434 Analog Signal Processing</td>
</tr>
<tr>
<td>EC539 Opto Electronics</td>
<td>EC233 Electronic Devices (1)</td>
</tr>
<tr>
<td>EC560 Modern Electronic Circuits</td>
<td>EC434 Analog Signal Processing</td>
</tr>
<tr>
<td><strong>Group 2: Communications</strong></td>
<td></td>
</tr>
<tr>
<td>EC520 Satellite Communications</td>
<td>EC422 Introduction to Digital Communications</td>
</tr>
<tr>
<td>EC521 Communication Networks</td>
<td>EC422 Introduction to Digital Communications</td>
</tr>
<tr>
<td>EC522 Acoustics</td>
<td>EC341 Electromagnetics</td>
</tr>
<tr>
<td>EC524 Optical Communications</td>
<td>EC422 Introduction to Digital Communications</td>
</tr>
<tr>
<td>EC525 Information Theory &amp; Coding</td>
<td>EC422 Introduction to Digital Communications</td>
</tr>
<tr>
<td>EC526 Mobile Communications</td>
<td>EC422 Introduction to Digital Communications</td>
</tr>
<tr>
<td>EC527 Applied Telecommunication Systems</td>
<td>EC322 Introduction to Communication Systems</td>
</tr>
<tr>
<td>EC528 Data Communication</td>
<td>EC422 Introduction to Digital Communications</td>
</tr>
<tr>
<td>EC529 Modern wireless Communications</td>
<td>EC422 Introduction to Digital Communications</td>
</tr>
<tr>
<td>EC550 International Operation Management</td>
<td>None</td>
</tr>
<tr>
<td><strong>Group 3</strong></td>
<td></td>
</tr>
<tr>
<td>CC524 Neural Networks</td>
<td>BA323 Mathematics (5)</td>
</tr>
<tr>
<td>CC527 Computer Aided-Design</td>
<td>CC112 Structured Programming</td>
</tr>
<tr>
<td>IM535 International Operation Management</td>
<td>None</td>
</tr>
<tr>
<td>EE512 Automated Industrial Systems 1</td>
<td>EE418 Automatic Control Systems</td>
</tr>
</tbody>
</table>
### Academic Program Analysis

#### YEAR ONE

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>NARS Characterization for Engineering by Subject Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Lab</td>
<td>Pre (1)</td>
</tr>
<tr>
<td>BA113</td>
<td>Physics 1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>BA118</td>
<td>Chemistry</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>BA123</td>
<td>Mathematics 1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>BA141</td>
<td>Engineering Mechanics 1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CC111</td>
<td>Introduction to Computers</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>IM 111</td>
<td>Industrial Relations</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>LH 131</td>
<td>English 1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>6</td>
<td>6</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>NARS Characterization for Engineering by Subject Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Lab</td>
<td>Pre (1)</td>
</tr>
<tr>
<td>BA114</td>
<td>Physics 2</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>BA124</td>
<td>Mathematics 2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>BA142</td>
<td>Engineering Mechanics 2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CC112</td>
<td>Structured Programming</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>IM112</td>
<td>Manufacturing Technology</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>LH132</td>
<td>English 2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>ME 151</td>
<td>Engineering Drawing &amp; Projection</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>13</td>
<td>8</td>
<td>6</td>
<td>18</td>
</tr>
</tbody>
</table>

* A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary
# B. Sc. Program Status Report 2009

## Year Two

### Semester Three

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>NARS Characterization for Engineering by Subject Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Lab</td>
<td>Pre (1)</td>
</tr>
<tr>
<td>LH231</td>
<td>ESP (3)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>BA223</td>
<td>Mathematics (3)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>EC210</td>
<td>Solid State Electronics</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>CC213</td>
<td>Programming Applications</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>NE465</td>
<td>Aesthetic Edu &amp; Art Appreciation</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>EE231</td>
<td>Electrical Circuits (1)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total**: 12 10 5 18

### Semester Four

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>NARS Characterization for Engineering by Subject Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Lab</td>
<td>Pre (1)</td>
</tr>
<tr>
<td>BA224</td>
<td>Mathematics (4)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>NE264</td>
<td>Scientific Thinking</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>EC233</td>
<td>Electronic Devices (1)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>EC217</td>
<td>Measurements &amp; Instrumentation</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>CC216</td>
<td>Digital Logic Design</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>EE232</td>
<td>Electrical Circuits (2)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total**: 12 12 4 18

---

* A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary
## Year Three

### Semester Five

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>NARS Characterization for Engineering by Subject Area</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Lab</td>
<td>Pre (1)</td>
<td>Pre (2)</td>
</tr>
<tr>
<td>BA323</td>
<td>Mathematics (5)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE328</td>
<td>Electrical Power &amp; Machines</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EC334</td>
<td>Analog and Digital Circuits Analysis</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CC312</td>
<td>Computer Organization</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EC332</td>
<td>Electronic Devices (2)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EC321</td>
<td>Signals and Systems</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>12</td>
<td>12</td>
<td>6</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

### Semester Six

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>NARS Characterization for Engineering by Subject Area</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Lab</td>
<td>Pre (1)</td>
<td>Pre (2)</td>
</tr>
<tr>
<td>BA326</td>
<td>Mathematics (6)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EC333</td>
<td>Electronic Amplifiers</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EC341</td>
<td>Electromagnetics</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EC322</td>
<td>Intro to Communication Systems</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CC413</td>
<td>Numerical Analysis</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EC311</td>
<td>Electronic Materials</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>12</td>
<td>12</td>
<td>4</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

* A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary
### SEMESTER SEVEN

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>NARS Characterization for Engineering by Subject Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Lab</td>
<td>Pre (1)</td>
</tr>
<tr>
<td>EC432</td>
<td>Microelectronic Circuits</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>EC421</td>
<td>Statistical Communication Theory</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>EC442</td>
<td>Electromagnetic Wave Propagation</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CC411</td>
<td>Introduction to Microprocessors</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>IM423</td>
<td>Operation Research</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>EE418</td>
<td>Automatic Control Systems</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>12</strong></td>
<td><strong>4</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

### SEMESTER EIGHT

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>NARS Characterization for Engineering by Subject Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Lab</td>
<td>Pre (1)</td>
</tr>
<tr>
<td>EC434</td>
<td>Analog Signal Processing</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>EC422</td>
<td>Introduction to Digital Communications</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>EC443</td>
<td>Electromagnetic Transmitting Media</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>NE364</td>
<td>Engineering Economy</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>EE419</td>
<td>Modern Control Engineering</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>EC410</td>
<td>Electronic Measurements</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>IM400</td>
<td>Practical Training</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>14</strong></td>
<td><strong>12</strong></td>
<td><strong>8</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

* A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary
<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>NARS Characterization for Engineering by Subject Area</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Lab</td>
<td>Pre (1)</td>
<td>Pre (2)</td>
</tr>
<tr>
<td>EC544</td>
<td>Antennas Engineering</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>EC443 None</td>
</tr>
<tr>
<td>EC523</td>
<td>Advanced Communication Systems</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>EC442 None</td>
</tr>
<tr>
<td>EC501</td>
<td>Project (1)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>None None</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>* *</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>* *</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>* *</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>12</td>
<td>12</td>
<td>4</td>
<td>18</td>
<td>Total 18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Contact Hours</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
<th>NARS Characterization for Engineering by Subject Area</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Lab</td>
<td>Pre (1)</td>
<td>Pre (2)</td>
</tr>
<tr>
<td>EC546</td>
<td>Microwave Technology</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>EC443 EC434</td>
</tr>
<tr>
<td>EC533</td>
<td>Digital Signal Processing</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>EC434 None</td>
</tr>
<tr>
<td>EC503</td>
<td>Project (2)</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>6</td>
<td>EC501 None</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>* *</td>
</tr>
<tr>
<td>*</td>
<td>Elective Course</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>* *</td>
</tr>
<tr>
<td>EC546</td>
<td>Microwave Technology</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>EC443 EC434</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>14</td>
<td>14</td>
<td>2</td>
<td>18</td>
<td>Total 18</td>
</tr>
</tbody>
</table>

* A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary
Program Analysis by Semester Offering

<table>
<thead>
<tr>
<th>Semester</th>
<th>Lecture</th>
<th>Tutorial</th>
<th>Lab</th>
<th>Total</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>9</td>
<td>5</td>
<td>26</td>
<td>4</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>13</td>
<td>2</td>
<td>27</td>
<td>2</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>12</td>
<td>3</td>
<td>27</td>
<td>6</td>
<td>4.5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0.5</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>12</td>
<td>4</td>
<td>28</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td>1.5</td>
<td>0.5</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>12</td>
<td>6</td>
<td>30</td>
<td>0</td>
<td>3</td>
<td>9</td>
<td>4.5</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>12</td>
<td>4</td>
<td>28</td>
<td>0</td>
<td>5</td>
<td>4.5</td>
<td>5.5</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>12</td>
<td>4</td>
<td>28</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>8</td>
<td>14</td>
<td>12</td>
<td>8</td>
<td>34</td>
<td>2</td>
<td>1</td>
<td>4.5</td>
<td>6</td>
<td>2.5</td>
<td>1</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>9</td>
<td>12</td>
<td>12</td>
<td>4</td>
<td>28</td>
<td>0</td>
<td>0</td>
<td>1.5</td>
<td>5</td>
<td>3</td>
<td>5.5</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>12</td>
<td>2</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>6.5</td>
<td>2.5</td>
<td>18</td>
</tr>
<tr>
<td>Grand Total</td>
<td>122</td>
<td>116</td>
<td>44</td>
<td>282</td>
<td>17</td>
<td>38.5</td>
<td>39.5</td>
<td>39</td>
<td>19.5</td>
<td>15</td>
<td>11.5</td>
<td>180</td>
</tr>
</tbody>
</table>

Percentage

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required NARS Percentage %</td>
<td>9-12</td>
<td>20-26</td>
<td>20-23</td>
<td>20-22</td>
<td>9-11</td>
<td>8-10</td>
<td>6-8</td>
<td></td>
</tr>
</tbody>
</table>

NARS Characterization by Course Group

<table>
<thead>
<tr>
<th>Subject Field</th>
<th>Lecture</th>
<th>Tutorial</th>
<th>Lab</th>
<th>Total</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA</td>
<td>25</td>
<td>20</td>
<td>7</td>
<td>52</td>
<td>6</td>
<td>29</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>41</td>
</tr>
<tr>
<td>CC</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5.5</td>
<td>1</td>
<td>1.5</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>CS</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>16</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>IM</td>
<td>9</td>
<td>6</td>
<td>0</td>
<td>15</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>LH</td>
<td>4</td>
<td>8</td>
<td>0</td>
<td>12</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>ME</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>EE</td>
<td>10</td>
<td>10</td>
<td>4</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Group 1</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>21</td>
<td>0</td>
<td>2.5</td>
<td>5.5</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Group 2</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>30</td>
<td>0</td>
<td>0</td>
<td>4.5</td>
<td>6</td>
<td>2</td>
<td>0.5</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Group 3</td>
<td>14</td>
<td>14</td>
<td>10</td>
<td>38</td>
<td>0</td>
<td>0</td>
<td>5.5</td>
<td>9</td>
<td>2.5</td>
<td>1</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Group 4</td>
<td>10</td>
<td>10</td>
<td>4</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>2.5</td>
<td>5.5</td>
<td>4</td>
<td>1</td>
<td>2.5</td>
<td>15</td>
</tr>
<tr>
<td>Electives</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>2.5</td>
<td>5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>15</td>
</tr>
<tr>
<td>Project</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>7.5</td>
<td>0.5</td>
<td>9</td>
</tr>
<tr>
<td>Grand Total</td>
<td>122</td>
<td>116</td>
<td>44</td>
<td>282</td>
<td>17</td>
<td>38.5</td>
<td>39.5</td>
<td>39</td>
<td>19.5</td>
<td>15</td>
<td>11.5</td>
<td>180</td>
</tr>
</tbody>
</table>

- Group 1: Solid State Electronics Courses
- Group 2: Communications Courses
- Group 3: Electronics Courses
- Group 4: Electromagnetics and Antennas Courses

* A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary
Distribution of Contact Hours by Semester (Absolute)

Distribution of Contact Hours by Semester (Percentage)
Distribution of Total Contact Hours.

Nars Characterization* by Semester (Absolute)

*A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary
<table>
<thead>
<tr>
<th>Semester</th>
<th>Humanities and Social Sciences</th>
<th>Mathematics and Basic Sciences</th>
<th>Basic Engineering Sciences</th>
<th>Applied Engineering and Design</th>
<th>Computer Applications and ICT</th>
<th>Projects and Practice</th>
<th>Discretionary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>11</td>
<td>17</td>
<td>11.5</td>
<td>12.5</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>19.5</td>
<td>12.5</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>19.5</td>
<td>12.5</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>19.5</td>
<td>12.5</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>19.5</td>
<td>12.5</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>19.5</td>
<td>12.5</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>19.5</td>
<td>12.5</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>19.5</td>
<td>12.5</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>9</td>
<td>19.5</td>
<td>12.5</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td>19.5</td>
<td>12.5</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

*Nars Characterization by Semester (Percentage)*

* A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary
Distribution of Total Contact Hours by Course Group (College)

Distribution of Total Contact Hours by Course Group (Department)
NARS Characterization* by Course Group (Absolute)

NARS Characterization* by Course Group (Percentage)

*A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Cr. Hrs.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC530</td>
<td>Micro-Electromechanical Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC535</td>
<td>Digital VLSI Design</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC536</td>
<td>VLSI Fabrication &amp; Testing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC537</td>
<td>Biomedical Electronics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC538</td>
<td>Selected Topics in Electronics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC539</td>
<td>Opto Electronics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC540</td>
<td>Modern Electronic Circuits</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC520</td>
<td>Satellite Communications</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC521</td>
<td>Communication Networks</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC522</td>
<td>Acoustics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC524</td>
<td>Optical Communications</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC525</td>
<td>Information Theory &amp; Coding</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC526</td>
<td>Mobile Communications</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC527</td>
<td>Applied Telecommunication Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC528</td>
<td>Data Communication</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC529</td>
<td>Modern Wireless Communications</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC550</td>
<td>Selected Topics in Communications</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC551</td>
<td>Telecom Systems Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC553</td>
<td>Media &amp; Entertainment Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>EC554</td>
<td>Advanced Antennas Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>CC524</td>
<td>Neural Networks</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>2</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>CC527</td>
<td>Computer Aided Design</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>2</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>EE512</td>
<td>Automated Industrial Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1.5</td>
<td>1</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>IM535</td>
<td>International Operations Management</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary
### NARS Characterization of EC Department Courses for Other Departments

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Pre</th>
<th>Cr. Hrs.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Computer Engineering Department</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Solid State and Measurements Course Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC218</td>
<td>Measurement &amp; Instrumentation</td>
<td>None</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1.5</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Electronics Course Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC238</td>
<td>Electronics 1</td>
<td>EE231</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EC339</td>
<td>Electronics 2</td>
<td>EC238</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Communications Course Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC320</td>
<td>Communication Theory</td>
<td>None</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Electrical and Control Engineering Department</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Electronics Course Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC238</td>
<td>Electronics 1</td>
<td>EE231</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EC339</td>
<td>Electronics 2</td>
<td>EC238</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Mechanical Engineering Department</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Electronics Course Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC331</td>
<td>Electronics</td>
<td>EE238</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EC534</td>
<td>Analog &amp; Digital Signal Processing</td>
<td>EC331</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Computer Science College</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Electronics Course Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC134</td>
<td>Fundamentals of Electricity &amp; Electronics</td>
<td>None</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*A: Humanities and Social Sciences; B: Mathematics and Basic Sciences; C: Basic Engineering Sciences; D: Applied Engineering and Design; E: Computer Applications and ICT; F: Projects and Practice; G: Discretionary*
## Comparison with Previous Program

### Communications Course Group

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Code</th>
<th>Title</th>
<th>Type of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC321</td>
<td>Spectral Analysis</td>
<td>EC321</td>
<td>Signals and Systems</td>
<td>Name and Contents</td>
</tr>
<tr>
<td>EC322</td>
<td>Continuous Wave Modulation</td>
<td>EC322</td>
<td>Introduction to Communication Systems</td>
<td>Name and Contents</td>
</tr>
<tr>
<td>EC421</td>
<td>Random Signals &amp; Noise</td>
<td>EC421</td>
<td>Statistical Communication Theory</td>
<td>Name and Contents</td>
</tr>
<tr>
<td>EC422</td>
<td>Introduction to Digital Communications</td>
<td>EC422</td>
<td>Introduction to Digital Communications</td>
<td>Contents</td>
</tr>
<tr>
<td>EC520</td>
<td>Satellite Communications</td>
<td>EC520</td>
<td>Satellite Communications</td>
<td>Contents</td>
</tr>
<tr>
<td>EC523</td>
<td>Signal Space &amp; Applications</td>
<td>EC523</td>
<td>Advanced Communication Systems</td>
<td>Name and Contents</td>
</tr>
<tr>
<td>EC525</td>
<td>Information Theory &amp; Coding</td>
<td>EC525</td>
<td>Information Theory &amp; Coding</td>
<td>Contents</td>
</tr>
<tr>
<td>EC527</td>
<td>Applied Telecommunications</td>
<td>EC527</td>
<td>Applied Telecommunications</td>
<td>Contents</td>
</tr>
<tr>
<td>EC529</td>
<td>Modern Wireless Communications</td>
<td>EC529</td>
<td>Modern Wireless Communications</td>
<td>Contents</td>
</tr>
<tr>
<td>EC550</td>
<td>Selected Topics in Communications</td>
<td>EC550</td>
<td>Selected Topics In Communications</td>
<td>Contents</td>
</tr>
<tr>
<td>EC551</td>
<td>Telecommunication Systems Engineering</td>
<td>EC551</td>
<td>Telecommunication Systems Engineering</td>
<td>Contents</td>
</tr>
<tr>
<td>EC532</td>
<td>Media &amp; Entertainment Engineering</td>
<td>EC553</td>
<td>Media &amp; Entertainment Engineering</td>
<td>Code and Area Association</td>
</tr>
</tbody>
</table>

### Electronics Course Group

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Code</th>
<th>Title</th>
<th>Type of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC333</td>
<td>Electronic amplifiers</td>
<td>EC333</td>
<td>Electronic amplifiers</td>
<td>Contents</td>
</tr>
<tr>
<td>EC334</td>
<td>Electronic circuit synthesis and analysis</td>
<td>EC333</td>
<td>Analog and Digital circuits analysis</td>
<td>Name and Contents</td>
</tr>
<tr>
<td>EC432</td>
<td>Microelectronic circuits</td>
<td>EC432</td>
<td>Microelectronic circuits</td>
<td>Contents</td>
</tr>
<tr>
<td>EC434</td>
<td>Analog signal processing</td>
<td>EC434</td>
<td>Analog signal processing</td>
<td>Contents</td>
</tr>
<tr>
<td>EC531</td>
<td>Microwave Technology</td>
<td>EC546</td>
<td>Microwave Technology</td>
<td>Code and Area Association</td>
</tr>
</tbody>
</table>
Courses Summary Description

Brief description of all courses including the number of credit hours and prerequisites.

EC Department Courses

Course Group: Solid State Electronics and Measurements

EC 210 – Solid State Electronic
Cr.3. Prerequisite: BA 114

EC 211 – Solid State Electronic (Computer Engineering Program)*
Cr.3. Prerequisite: BA 114

EC 217 – Measurements & Instrumentations
Cr.3. Prerequisite: EE 231
Measurements of errors- Accuracy- Precision- Resolution- Sensitivity. Statistical analysis (Mean- Deviation- Standard Deviation- Variance). Units and standards of measurement. Electromechanical
indicating instruments. Analog Instruments (DC Ammeter (Ayrton Shunt)- DC Voltmeter-Ohmmeter (Series type- Shunt Type)- AC- Instruments with Rectifiers(full wave and half wave rectifiers)- Bridge measurements (AC Bridges(Maxwell bridge- Wien bridge- Schering bridge)- DC Bridges(Wheatstone bridge))- Digital instruments for measuring True RMS Voltmeter- Q-meter- oscilloscope techniques.

**EC 218 – Measurements & Instrumentations (Computer Engineering Program)**
*Cr.3. Prerequisite: EE 231*

Measurements of errors- Accuracy- Precision- Resolution- Sensitivity. Statistical analysis (Mean Deviation- Standard Deviation- Variance). Units and standards of measurement. Electromechanical indicating instruments. Analog Instruments (DC Ammeter (Ayrton Shunt)- DC Voltmeter- Ohmmeter (Series type- Shunt Type)- AC- Instruments with Rectifiers (full wave and half wave rectifiers)- Bridge measurements (AC Bridges(Maxwell bridge- Wien bridge- Schering bridge)- DC Bridges(Wheatstone bridge))- Digital instruments for measuring True RMS Voltmeter- Q-meter- oscilloscope techniques.

**EC 311 – Electronic Materials**
*Cr.3. Prerequisite: EC 210*


**EC 416 – Electronic Measurements (Mechatronics Engineering Program)**
*Cr.3. Prerequisite: EC 331*


**EC 410 – Electronic Measurements**
*Cr.3. Prerequisite: EC 432*

### Course Group: Communications

**EC 320: Communication Theory (Computer Engineering Program)**
*Cr. 3. Prerequisite: BA 224 – EE 231*

Introduction to communication theory. Review of Fourier series and Fourier transform as a mathematical tool for spectral analysis. Concept of power and energy spectral densities and correlation between waveforms. Transmission through linear filters and channels. Hilbert transform and Amplitude Modulation techniques.

**EC 321 – Signals and Systems**
*Cr. 3. Prerequisite: BA 224 – EE 231*

Introduction to communication theory. Fourier transform as a mathematical tool for spectral analysis. Sampling Theory- Convolution of continuous and discrete signals- Correlation- Concept of power and energy spectral densities and correlation between waveforms. Transmission through linear filters and channels. Hilbert transform and Positive pre-envelope and complex envelope. Response of LPF and BPF to signals.

**EC 322 – Introduction to Communication Systems**
*Cr. 3. Prerequisite: BA 323 – EC 321*


**EC 323 – Introduction to Communication Systems (Computer Engineering Program)**
*Cr. 3. Prerequisite: EC 320*


**EC 421 – Statistical Communication Theory**
*Cr. 3. Prerequisite: BA 326 – EC 322*

Review of probabilities- R.V.- characteristic function- joint R.V.- correlation- independence - Random processes: Stationarity- Ergodicity with applications to line codes - AWGN channels and band-pass noise - AM/ FM with the presence of noise - Noise effect on analog pulse modulation - Noise effect on PCM.

**EC 422 – Introduction to Digital Communications**
*Cr. 3. Prerequisite: EC 421*

Bandpass data transmission - Gram Schmidt orthogonalization procedure- Geometric representation of signals in signal space - Noise effect in signal space- Decision regions and related
probability of error - binary modulation techniques (CB-ASK- CB-FSK- CB-PSK) - Optimum FSK- MSK - Non-Coherent Detection- NC-FSK – DPSK.

**EC 520 – Satellite Communications**
Cr.3. Prerequisite: EC 422


**EC 521 – Communication Networks**
Cr.3. Prerequisite: EC 422


**EC 522 – Acoustics**
Cr.3. Prerequisite: EC 341

Acoustic wave and velocity of sound - The one-dimensional wave equation - Impedance of mediums - Three-dimensional wave equation and spherical wave - Sound intensity and power - Energy density and levels - Multiple sources and loudness - Environmental acoustics - Equivalent sound pressure level and assessment of noise - Analogy between acoustical and electrical circuits - Transducers and sensitivity of MICs and loudspeakers - Hi-fi system and introduction of underwater acoustics - Velocity profiles and SONAR

**EC 523 – Advanced Communication Systems**
Cr.3. Prerequisite: EC 422

Frequency Division Multiple Access (FDMA)- Time Division Multiple Access (TDMA)- Code Division Multiple Access (CDMA). OFDM- OFDMA- Examples of FDMA- TDMA- and CDMA systems- and their applications.

**EC 524 – Optical Communications**
Cr.3. Prerequisite: EC 422


**EC 525 – Information Theory and Coding**
Cr.3. Prerequisite: EC 422

Review of probability theory - Concept of information theory and coding - Average information & Entropy – Mutual information - Channel capacity - Bandwidth and S/N of a channel - Source
Coding - Channel Coding Theorem - Linear block codes - Convolutional codes - Viterbi decoding - Turbo Codes - Iterative decoding - Performance of different coded modulation in AWGN channels.

**EC 526 – Mobile Communications**
*Cr.3. Prerequisite: EC 422*

Difference between conventional mobile and cellular mobile - Overview on different cellular generations - Cellular radio design principles - Concept of frequency reuse/cellular block diagram - Co channel interference/adjacent channel interference - Multipath propagation - Speech coding in GSM - Channel coding and interleaving in GSM - GSM mobile station block diagram - Multiple access techniques - Control channels in GSM - Location updating - security management.

**EC 527 – Applied Telecommunications**
*Cr.3. Prerequisite: EC 322*

Introduction to radar system - Classification and principles of the radar system - The radar equation - Probability of detection - The digital radar - terminals - transmission and switching. Analog and Digital telephone networks.

**EC 528 – Data Communications**
*Cr.3. Prerequisite: EC 422*

This course covers the fundamental issues impacting all data networks and reviews virtually most of the important new standard and technological development- offering especially Comprehensive coverage of the physical layer and packet switching techniques.

**EC 529 – Modern Wireless Communications**
*Cr.3. Prerequisite: EC 422*


**EC 550 – Selected Topics in Communications**
*Cr.3. Prerequisite: EC 422*


**EC 551 – Telecommunication Systems Engineering**
*Cr.3. Prerequisite: EC 422*

EC 553 – Media and Entertainment Engineering **
Cr.3. Prerequisite: EC 422

Stereophonic broadcasting systems - TV scanning and broadcasting - Detailed block diagram of a TV transmitter and receiver - Colour TV fundamentals - NTSC-PAL- and SECAM systems - Digital TV - HDTV and Satellite TV - Audio recording analog and digital - Compact disc and CD player - Reflection and ray tracing theory - Acoustical treatment and studio design.

* Courses for other departments
** Elective Course

Course Group: Electronics

EC 134 – Fundamentals of Electricity and Electronics (Computer Science Program)*
Cr.3. Prerequisite: None

This course provides an introduction to the basic concepts of electricity and electronics concepts. This is useful in understanding the operations of robotics. The topics of interest include the basics of electricity and electrical circuit's components. It covers also the basic DC and AC circuits' analysis, power and resonance, and transformers. The electronic topics include semiconductors diodes and transistors. The course covers practical and applications of the studied topics in the operations of amplifiers and oscillators.

EC 233 – Electronic Devices (1)
Cr.3. Prerequisite: EC 210

P-N junction diode- current components- junction capacitance- junction diode- as a circuit element- special types of P-N junctions. P-N junction diodes- current components- junction capacitance- junction diode as a circuit element.

EC 238 – Electronics (1) (Computer Eng. Program + Electrical & Control Eng. Program)*
Cr.3. Prerequisite: EE231

Semiconductors - p-n junction - diode current components - junction capacitance - junction diode as a circuit element - special p-n junctions - bipolar junction transistor and field effect transistor: structure- operation – I-V characteristics - large and small analysis.

EC 331 – Electronics (Mechatronics Engineering Program)*
Cr.3. Prerequisite: EE 328


EC 332 – Electronic Devices (2)
Cr.3. Prerequisite: EE232 – EC 233

EC 333 - Electronic Amplifiers  
Cr.3. Prerequisite: EC 332 – EC 217

Revision on Single Stage BJT Amplifiers - Cascode - MOSFET Common Source, Source Follower and Common Gate Amplifier – Cascode and Folded Cascode Amplifier - Frequency Response of MOSFET Circuits - Feedback Amplifiers - Feedback Topologies - Stability - Ring Oscillator and LC Oscillators - Voltage Controlled Oscillators - Power Amplifier - Tuned Amplifiers

EC 334 - Analog and Digital Circuits Analysis  
Cr.3. Prerequisite: EE232


EC 339 - Electronics (2) (Computer Eng. Program + Electrical & Control Eng. Program)*  
Cr.3. Prerequisite: EC 238

Electronic amplifier theory- power amplifiers- Differential amplifiers- Operational amplifiers filters and Oscillators.

EC 432 - Microelectronic Circuits  
Cr.3. Prerequisite: EC 333

Differential Amplifiers - Current Mirrors - Noise in Electronic Circuits - Operational Amplifiers - Phase Locked Loops - Switched Capacitor Circuits - IC Fabrication Steps

EC 434 - Analog Signal Processing  
Cr.3. Prerequisite: EC 432

Linear and nonlinear wave shaping- sinusoidal and relaxation oscillators- sweep generators- analog filters.

EC 533 - Digital Signal Processing  
Cr.3. Prerequisite: EC 434

ADC's and DAC's, DFT, FFT and DCT, the Z-transform, discrete time transfer function, realization topologies, FIR filter design using windowing, Optimal method, frequency sampling method , least path norm method using MATLAB . IIR filter design, stability, bilinear transform, least path norm method using MATLAB. Applications of DSP e.g. data compression Data acquisition systems….etc
EC 534– Analog and Digital Signal Processing (Mechtronics Engineering Program)*
Cr.3. Prerequisite: EC 331

Simple analog wave shaping circuits- Sinusoidal and square wave generators. Design of RC active filters- ADC's and DAC's. Discrete transforms. Digital filter design.

EC 530– Micro – Electromechanical Systems MEMS **
Cr.3. Prerequisite: EC 434

MEMS technology- revolution and advantages of MEMS technology. Description of the MEMS applications- and its fabrication techniques. Studying the nature of the piezoelectricity and piezoresistivity. Description of the microsensors- microactuators- different system issues and the scaling effect. Finally describing the Microassembly and an overview on Microrobotics.

EC 535 – Digital VLSI Design **
Cr.3. Prerequisite: EC 432 – CC 216

Design of VLSI digital circuits- Stick diagrams- design rules- CAD system- speed and power considerations- floor planning- layout techniques

EC 536 – VLSI Fabrication and Testing of Integrated Circuits **
Cr.3. Prerequisite: EC 535


EC 537 – Biomedical Engineering **
Cr.3. Prerequisite: EC 434

Introducing basic concepts in biomedical engineering and applications of electronics in patient care medical – equipment.

EC 538 – Selected Topics in Electronics**
Cr.3. Prerequisite: EC 434

A Selection from modern topics in electronics.

EC 539 – Optoelectronics**
Cr.3. Prerequisite: EC 233


EC 560 – Modern Electronic Circuits**
Cr.3. Prerequisite: EC 434
Electronic circuits used in modern communications— including RF amplifiers— oscillators— modulators— Noise— transmitter circuits— receiver circuits— frequency and phase modulation— phase- locked loops and frequency synthesizers— pulse and digital modulation— data communication techniques— wireless and digital communications circuits.

* Courses for other departments

** Elective Course

Course Group: Antennas and Microwaves

EC 341 – Electromagnetics
Cr.3. Prerequisite: BA 114 – BA 224

Review of vector analysis— electromagnetic fields: Coulombs law— electric field and flux density— Gauss's law— electric potential— conductors and semi-conductors— dielectric and capacitance— polarization— magnetic field and flux density— Biot Savart law— Ampere’s law— magnetic potential— Maxwell’s equations and magnetization vectors— Faraday’s law— displacement vector— analogy between electrostatics & magneto static— boundary conditions.

EC 442 – Electromagnetic Wave Propagation
Cr.3. Prerequisite: EC 341


EC 443 – Electromagnetic Transmitting Media
Cr.3. Prerequisite: EC 442


EC 544 – Antennas Engineering
Cr.3. Prerequisite: EC 443


EC 545 – Advanced Antennas Systems **
Cr.3. Prerequisite: EC 443

** Elective Course

** Course Group: Project Courses

** Course Group: Basic & Applied Sciences
Electrochemical reactions and cells, volumetric analysis (practical) - Principles of corrosion, titrate technique, determine of acidity (practical) - Metals and corrosive environments, determinate of alkalinity and chloride (practical) - Forms of corrosion uniform, galvanic and differential aeration cell, determination of hardness (practical) - Pitting, stress corrosion cracking and intergranular corrosion forms, determination of dissolved oxygen (practical) - Atmospheric and erosion corrosion, spectrophotometer analysis (practical) - Coating and inhibitors as protection methods, determination of nitrite and nitrate (practical) - Cathodic protection, determination of phosphate and silica (practical) - Classification of fuel, properties of liquid fuel, determination of some heavy metals (practical) - Combustion of fuel, determination of fluorine and chlorine (practical) - Air supply and exhaust gases, determination of turbidity (practical) - Classification of lubricants advantages and disadvantages of different types, oil analysis determination of viscosity and T.B.N (practical) - Properties of lubricants and additives, determination of insoluble and saltwater (practical) - Nature of impurities in water, soft and hard water effect of using impure water on boilers performance, determination of acidity and water content (practical) - Water treatment, determination of pH (practical) - Air and water pollution, determination of TDS and salinity (practical).

**BA 123 – Mathematics (1)**

*Cr.3. Prerequisite: None*

Basic techniques and rules of differentiation - Trigonometric function: properties, basic identities and their derivatives - Inverse of trigonometric and their derivatives - Logarithmic functions: their properties, basic identities and derivatives - Exponential functions: their properties, basic identities and derivatives - Derivative of hyperbolic functions and their inverse - Parametric differentiation and implicit differentiation - The Nth derivative - L' Hospital rule - Partial differentiation - Maclaurin’s expansion. - Physical application - Curve sketching - Conic sections - General revision.

**BA 124 – Mathematics (2)**

*Cr.3. Prerequisite: BA123*

Definition of indefinite integrals and table of famous integrals - Simple rules of integration and the fundamental theorem of calculus - Fundamental theorem of calculus and integration by parts - Integration by parts and integration of rational functions - Integration of rational functions - Integration of trigonometric powers - Trigonometric substitution and 7th week exam - Integration of quadratic forms and the reduction formulas - Definite integration - Area and volume - Area, volume and length of curve - Average of a function, numerical integration - Matrix Algebra - Solution of systems of linear equations.

**BA 141 – Engineering Mechanics (1)**

*Cr.3. Prerequisite: None*


**BA 142 – Engineering Mechanics (2)**

*Cr.3. Prerequisite: BA141*

Kinematics of a particle – Rectilinear Kinematics - Curvilinear Motion – Projectile Motion - Force & Acceleration (Kinetics) - Work & Energy of a particle (Kinetics) - Rotation of a Rigid Body
about a fixed Axis - General Plan Motion - Relative Motion (Velocity) - Relative Motion (Acceleration) - Planar Kinetics of Rigid Body – Equation of Translation Motion - Equation of Rotational Motion - Equation of General Plane Motion - Work and Energy.

**BA 223 – Mathematics (3)**
*Cr.3. Prerequisite: BA124*

Solving first order differential equations: Separable of variables and Homogeneous equation - Solving first order differential equations: Exact and Linear equations - Solving first order differential equations: Bernoulli's equation and revision on first order differential equations - Solving second order homogeneous differential equations with constant coefficients, method of undetermined coefficients - Solving second order non-homogeneous differential equations with constant coefficients, method of variation of parameters - Continue method of variation of parameters, solving second order differential equations with variable coefficients (Euler's equation), Laplace transform: Basic definition, First shifting theorem, Laplace transform: Transform differentiation and integration, Unit step function, second shifting theorem, and convolution theorem - Inverse Laplace transforms - Solving differential equations by using Laplace transform - Fourier series: Fourier series for functions of period 2P - Fourier series for even and odd functions - Fourier series for harmonic functions.

**BA 224 – Mathematics (4)**
*Cr.3. Prerequisite: BA223*


**BA 323 – Mathematics (5)**
*Cr.3. Prerequisite: BA 224*


**BA 326 – Mathematics (6)**
*Cr.3. Prerequisite: BA 124*

An introduction to statistics and statistical analysis on data observation – Statistical measurements – Elementary probability, probability theorems – Conditional probability, Independent and

**Course Group: Computer Engineering (CC)**

**CC 216 – Digital Logic Design**  
*Cr. 3. Prerequisite: CC 111*

Number systems - binary arithmetic and codes - logic gates - Boolean algebra and logic simplifications - Design and realization of combinational circuits - Functions of combinational circuits logic - Flip-Flops - analysis design and realization of counters - analysis and realization of shift registers - Computer aided engineering.

**CC 312 – Computer Organization**  
*Cr. 3. Prerequisite: CC 216*

Computer interconnection structures - computer components - computer function interconnection structures - bus interconnection - Internal and external memory - computer memory system overview - semiconductors main memory - cache memory - magnetic tape - optical memory - Input / Output - I/O modules - programmed I/O - interrupt-driven I/O - direct memory Access - Operating system - Operating systems overview – scheduling - memory management - The central processing unit - Computer Arithmetic - characteristics and functions of instruction sets - addressing modes - processor organization - the instruction cycle - instruction pipelining - Control unit Micro-operation - hardware implementation - Control Functions.

**CC 411 – Introduction to Microprocessors**  
*Cr. 3. Prerequisite: CC 312 or CC216*

Microprocessors and microcomputers - Microcomputer structure – microprocessor – memory - buses (synchronous and asynchronous) - I/O - 16/32-bit microprocessor architecture - Instruction cycle – microinstructions - micro-programming - instruction decoding - Reduced Instruction Set computer (RISC) architecture - Complex Instruction Set computer (CISC) architecture - Memory (RAM, ROM, memory mapping of I/O) - 1/O (parallel and serial I/O interfaces, system clock, clock phases and bit rates) - Interrupts (types, handling of interrupts) - Software aids (text editors and assemblers, linkers and macro-assemblers).

**CC 524 – Neural Networks**  
*Cr. 3. Prerequisite: CC 112 – BA 323*

CC 527 – Computer Aided Design  
Cr. 3. Prerequisite: CC 311 – CC 341

To introduce fundamental algorithms and techniques for computer aided integrated circuit design - covers aspects of design flow - physical design - logic optimization - timing analysis and verification - synthesis for testability.

**Course Group: Computer Sciences (CS)**

**CC 111 – Introduction to Computers**  
Cr. 3. Prerequisite: None

Introduction to computers and computing - topics of interest include the impact of computers on society, ethical issues, and hardware / software applications, including internet applications, system unit, storage and input/output devices, numbering systems, system and application software - presentation skills - program development - programming languages - flow charts - Visual Basic - web page design using HTML and communications and networks.

**CC 112 – Structured Programming**  
Cr. 3. Prerequisite: CC 111

Introduction to C - Variable/Constant definitions, Basic Programmes - Sequential Programming - Conditional Programming - Looping and repetitions – Functions - Arrays as well as searching and sorting techniques.

**CC 213 – Programming Applications**  
Cr. 3. Prerequisite: CC 112

An advanced C-language Programming is provided - two dimensional arrays – strings – pointers – recursion – structures – bitwise operators – input and output interfacing as well as text and binary files are covered in details.

**CC 413 – Numerical Analysis**  
Cr. 3. Prerequisite: CC 112 and BA224

Introduction to numerical methods and their applications - solve science and engineering problems - convergence - error analysis of numerical methods.

**Course Group: Electrical Engineering (EE)**

**EE 231 – Electrical Circuits (1)**  
Cr. 3. Prerequisite: B/A 124

EE 232 – Electrical Circuits (2)  
Cr.3. Prerequisite: EE 231


EE 328 – Electrical Power and Machines  
Cr.3. Prerequisite: EE 232

Magnetic circuits and their basic relations– Core loss and transformer basic– Transformer model and voltage regulation– Transformer rating and testing– The law of motor and generator action – construction of dc machines– DC motors characteristics and applications– DC generators characteristics and applications – AC rotating fields and theory of 3-phase induction machines– Circuit model and variable speed drives – Synchronous motors and generators– Single-phase and small motors –The electric power system and energy sources– Pollution problems and plant distribution systems– Switches and circuit breakers – system voltage and motors– System protection and power factor correction

EE 418 – Automatic Control Systems  
Cr.3. Prerequisite: EE 328


EE 419 – Modern control Engineering  
Cr.3. Prerequisite: EE 418


EE 512 – Automated Industrial Systems (1)  
Cr.3. Prerequisite: EE 418

Automation hierarchical levels and components– Detecting sensors and actuating elements, relay logic and their applications– Introduction to PLC’S– Types of PLCs and construction – Hardware
configuration and descriptions—Programming and testing basic functions—Programming and testing advanced functions—Industrial Applications using PLCs.

**Course Group: Industrial and Management Engineering (IM)**

**IM 111 – Industrial Relations**  
*Cr.2. Prerequisite: None*


**IM 112 – Manufacturing Technology**  
*Cr.2. Prerequisite: None*


**IM 423 – Operations Research**  
*Cr.3. Prerequisite: 90 Credit Hours.*

Introduction to linear programming – Development of linear programming models – The graphical and simplex method – Transportation and assignment methods – Network models and analysis (minimal spanning tree, shortest route, and maximal flow) – Critical path method – Probabilistic approach, project evaluation and review technique (PERT) – Project crashing.

**IM 535 – International Operations Management**  
*Cr.3. Prerequisite: 126 Credit Hours.*


**Course Group: Language, Humanities and Social Science (LH)**

**LH 131 - ESP I**  
*Cr.2. Prerequisite: None*

**LH 132 - ESP II**  
*C*2. **Prerequisite:** LH 131


**LH 231 - ESP III**  
*C*3. **Prerequisite:** LH 131, LH 132


**Course Group: Mechanical Engineering (ME)**

**ME 151 - Engineering Drawings & Projection**  
*C*2 **Prerequisite:** None


**Course Group: Non-Engineering (NE)**

**NE 264 – Scientific Thinking**  
*C*3. **Prerequisite:** None

Thinking Patterns Development - Nature and postulates of scientific thinking - Meaning and objective of Science - Scientific values and directions - Science, non-science and other-than science - Engineering and Technology - Properties of science - Mental operations used in science and Scientific Guessing - Types of deductions and Representation - Research methods in natural sciences: definitions, Experiments, Observations, Scientific postulates and their conditions - Verification of scientific postulates - General methods of problems solving - Creative and critical Thinking - Fluency types – Flexibility - Originality and Basics of Brain Storming.

**NE 465 – Aesthetic Education and Art Appreciation**  
*C*3. **Prerequisite:** None.
Aesthetic training and appreciation on a wide range of types of arts, including Music, Drawing, Painting, Sculpture and Engraving - Applied art (major and minor arts) - The Ancient world, Classical world and Christian world (Christianity) - Islamic and oriental arts - Medieval Western world - Renaissance in the 17th, 18th and 19th Centuries - Modern arts in the 20th Century.

NE 364 - Engineering Economy
Cr.3 Prerequisite: 54 Credit Hours

Introduction and overview – Cost concepts and the economic environment – Principles of money, time relations – the concept of economic equivalence – Cash flow diagrams interest formulas and uniform series – Cash flow diagrams uniform gradient series and geometric sequence – Nominal and effective interest rates continuous compounding and continuous cash flows – Applications of engineering economy methods of investment assessment – Comparing alternatives useful life is equal to the study period – The imputed market value technique – Depreciation historical methods and cost recovery systems.
Course File Summary

Further description of courses including course information, grading system, course description, textbook and reference book, course aim and objectives, and course outline.

This chapter provides further description of the courses of the Electronics and Communications Engineering program. The course files are organized as follows:

- Basic and Applied Science Courses – BA
- Computer Engineering Courses – CC
- Electronics and Communications Engineering Courses – EC
- Electrical Engineering Courses – EE
- Industrial and Management Engineering Courses – IM
- Language, Humanities, & Social Science Courses – LH
- Mechanical Engineering Courses – ME
- Non-Engineering Courses – NE
Electronics and Communications Engineering Courses

Solid State Electronics and Measurements Courses Group

EC 210 – Solid State Electronics

Course Information

Course Title: Solid State Electronics.
Hours: Lecture – 2 Hr. Tutorial/Lab – 2/1 Hrs. Credit – 3.
Prerequisite: BA114, BA118.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:

Elementary materials science concepts: Atomic structure, Bonding and types of solids, The crystalline state. Lattice vibrations. The hall effect and hall devices. Quantum mechanics: photons, particles and waves, the electron as a wave, infinite potential well, Heisenberg’s uncertainty principle, Tunneling phenomenon (potential barrier). The band theory of solids: E-K diagram, energy bands diagram, Electrons and holes, effective mass Semiconductors: Intrinsic semiconductors, Extrinsic semiconductors (n-type doping, p-type doping, compensation doping), Electron and holes Concentrations, Fermi energy level position, Conductivity of a semiconductor, Diffusion and conduction currents equations. Definitions for dielectric and magnetic materials and superconductivity.

Text Books:


Reference Books:

C. Kittel, Introduction To Solid State Physics, John Wiley and Sons

Course Aim:

To present the basic physical concepts about the operational principles of crystalline solids.
COURSE OBJECTIVES:

The knowledge of the fundamental principles is described in this course; the student will be able to follow the theoretical details of the advanced-level courses.

COURSE OUTLINE:

**Week Number 1:** General introduction for the course contents and the grading system.

**Week Number 2:** Atomic structure, Molecules and general bonding principles.

**Week Number 3:** Types of crystals models.

**Week Number 4:** Covalent Bond, Metallic Bond, Ionic Bond

**Week Number 5:** Miller indices: crystal directions and planes.

**Week Number 6:** The dispersion relationship of a mono atomic lattice vibrations, phase and group velocities.

**Week Number 7:** Particles and waves

**Week Number 8:** De Broglie relationship, time independent Schrödinger equation, Heisenberg’s uncertainty principle.

**Week Number 9:** Application on Schrödinger equation (Infinite potential well: A confined electron)

**Week Number 10:** Application on Schrödinger equation (Tunneling phenomenon: Quantum leak)

**Week Number 11:** Energy Band theory of solids: (energy bands, effective mass, concept of a hole)

**Week Number 12:** (Semiconductors) Intrinsic semiconductors (Si crystal and energy band diagram, electrons and holes, conduction in semiconductors, electrons and holes concentrations).

**Week Number 13:** (Semiconductors) Extrinsic semiconductor: (n-type doping, p-type doping, compensation doping) and carriers concentrations. Fermi energy level position.

**Week Number 14:** Semiconductor conductivity and resistivity.

**Week Number 15:** Semiconductors (Diffusion and conduction current equations).

**Week Number 16:** Final Exam.
EC 217 - Measurements & Instrumentation

COURSE INFORMATION

Course Title: Measurements & Instrumentation.

Code: EC 217.

Hours: Lecture – 2 Hr. Tutorial/Lab – 2/2 Hrs. Credit – 3.

Prerequisite: EE 231.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

Measurements of errors, Accuracy, Precision, Resolution, Sensitivity. Statistical analysis (Mean, Standard Deviation, and Variance). Units and standards of measurement. Electromechanical indicating instruments. Analog Instruments (DC Ammeter (Ayrtom Shunt), DC Voltmeter, Ohmmeter (Series type, Shunt Type), AC- Instruments with Rectifiers, Bridge measurements (AC Bridges, DC Bridges), Digital instruments for measuring basic parameters, oscilloscope techniques.

TEXT BOOKS:

Albert Helfrick and William Cooper, “Modern electronic instrumentation and measurements techniques”

REFERENCE BOOKS:

- Larry Jones and A. Foster Chin ,“Electronic measurements and instruments”
- J.B.GUPTA, “Electronic and Electrical Measurements and Instrumentation”

COURSE AIM:

An Introduction to the basic concepts and techniques of measuring physical electrical and electronic quantities. To train students for the effective usage of the basic Lab instruments

COURSE OBJECTIVES:

Understanding the basic measurement techniques such as accuracy, precision, standards. To study the operation and construction of analog, electronic and digital multi-meters.
COURSE OUTLINE:

Week Number 1: Definitions, The importance of electronic measurements for engineers, Types of errors

Week Number 2: Statistical analysis

Week Number 3: Review on the fundamental and derived units, Classification of standards, Electrical standards, IEEE standards

Week Number 4: Permanent magnet moving coil

Week Number 5: DC voltmeters, sensitivity, Use the sensitivity method for the design of DC voltmeter, Analyze a circuit taken into consideration in loading effect

Week Number 6: Series type and shunt type ohmmeters, Calibration of DC instruments

Week Number 7: 7th week exam

Week Number 8: Alternating current indicating instruments, AC voltmeters with full wave rectifiers and half Wave rectifiers.

Week Number 9: DC bridges and sources of error, AC bridges

Week Number 10: AC voltmeters using rectifiers

Week Number 11: True RMS– Responding Voltmeter

Week Number 12: Component measuring instruments, Basic Q-meter circuits: a- Direct connection b- Series connection c- Parallel connection Sources of error

Week Number 13: Oscilloscope measurements (phase shift, period and voltages)

Week Number 14: Oscilloscope block diagram

Week Number 15: Oscilloscope techniques, Special oscilloscopes, (a) storage oscilloscope, (b) sampling oscilloscope (c) Digital storage oscilloscope

Week Number 16: Final Exam.
EC 311 - Electronic Materials

Course Title: Electronic Materials.

Code: EC 311.


Prerequisite: EC 210.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description:

Free electron model, Electric conductivity, and Dielectric properties: Microscopic electric field Dielectric constant and polarisability, local electric field at an atom. Magnetic materials and Ferroelectric Crystals. Diamagnetism and Para-magnetism, Ferromagnetic order. Antiferromagnetic order. Ferromagnetic domains, superconductivity. Destruction of superconductivity by magnetic fields, Meissner effect.

Text Books:


Reference Books:

- C.Kittel, Introduction To Solid State Physics, John Wiley and Sons

Course Aim:

Understanding The properties of materials at microscopic level and their use in the electrical engineering area

Course Objectives:

Understanding the properties of:

- Dielectrics
- Ferromagnetic materials
- Magnetic materials
B. SC. PROGRAM STATUS REPORT 2009

- Superconductor materials at microscopic and macroscopic level

COURSE OUTLINE:

Week Number 1: Free electron gas model and Fermi-Dirac statistics.

Week Number 2: Modern theory of metals and electric conductivity.

Week Number 3: Introduction to Dielectrics “Introduction, Basic Formula”

Week Number 4: Dielectric constant & Local Field” Polarisability, Local field, Lorentz sphere and its field.

Week Number 5: Clausius Mossoti relation, Sources of Polarisability, Relation Between polarisability and frequency.

Week Number 6: Approximations of dipolar polarisability, Distinguish Between polar and non polar materials, Dipolar Dispersion, Complex dielectric constant, Dipolar polarization in solids

Week Number 7: Polarisability and Electrical Properties “Ionic Polarisability, Electronic Polarisability, Piezoelectricity, Ferro electricity.

Week Number 8: Introduction to Magnetism, classification of material” “Introduction, Review of Basic formula, Zee-man splitting”

Week Number 9: Diamagnetism and its material, Kinds of magnetic materials and its classifications, Classical Diamagnetism, Langavin Diamagnetism, Diamagnetic susceptibility

Week Number 10: Para magnetism and its material. Classical Para magnetism, Quantum Para magnetism, Atomic origin of magnetism (Hand’s Rule), Magnetism in metals

Week Number 11: Ferromagnetism, Molecular Field Theory, The Physical origin of molecular field theory

Week Number 12: Antiferrimagnetism and magnetic domain “Antiferromagnetism, Ferrimagnetism, Ferromagnetism in metals, Magnetic domains”

Week Number 13: Introduction to Superconductivity and magnetic domain. “Introduction and overview, Zero resistance (resistivity - temperature curve), Occurrence of superconductivity”

Week Number 14: “Perfect Diamagnetism (Meissner Effect), Critical Field, Curves of the critical field”

Week Number 15: Electrodynamics of superconductivity and revision” Electrodynamics of Superconductivity (Using Maxwell equations), Revision”

Week Number 16: Final Exam.
EC 410 - Electronic Measurements

COURSE INFORMATION

Course Title: Electronic Measurements.
Code: EC 410.
Prerequisite: EC 432.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:


TEXT BOOKS:

Cooper, Electronic instrumentation and measurement techniques, 1990 by Prentice-Hall, Inc.

REFERENCE BOOKS:

- Berlin, Experiment in electronic devices, 1984 by Bell & Howell company
- J.B.GUPTA” Electronic and Electrical Measurements and Instrumentation”

COURSE AIM:

Understanding the basics of electronic measurements that are prerequisite for study of more sophisticated systems such as automatic measurement and control.
COURSE OBJECTIVES:

- Understanding the requirements to generate electronic signals.
- Discussing different techniques to stabilize strength and frequency.
- Understanding different techniques to measure and calibrate frequency.
- Appreciate the transducers and data acquisition system.

COURSE OUTLINE:

*Week Number 1:* Inverting and Non-inverting amplifier. AC signal sources, signal generator, Oscillators. Classification of Oscillators. Requirements of oscillation.

*Week Number 2:* Audio Frequency Oscillator, Wien bridge Oscillators, Phase shift Oscillators, Frequency, Gain, Feedback Factor and their Applications

*Week Number 3:* Radio Frequency Oscillators: Colpitts Oscillators, Hartley Oscillators, Crystal Oscillators Frequency, Gain, Feedback Factor and their Applications

*Week Number 4:* Function Generators, Characteristics of each part and its analysis

*Week Number 5:* Attenuators circuit, L-type Attenuators, T-type Attenuators, Pi-type Attenuators

*Week Number 6:* Signal Analysis: Harmonic Distortion, Frequency Spectrum of Harmonic distortion, Harmonic Distortion Analyzer

*Week Number 7:* Wave analyzer, Resonance wave analyzer, Heterodyne wave analyzer, Spectrum analyzer, Heterodyne spectrum analyzer

*Week Number 8:* Transducers, Classification of Transducers, Active and Passive Transducers. Digital and Analog Transducers. Primary and Secondary Transducers. Selection of Transducers.

*Week Number 9:* Displacement Transducer, Resistive position Transducers and Strain Gauge Transducers.

*Week Number 10:* Capacitive Transducers, rotary plate capacitor, Recti-linear Capacitor, Diaphragm. Inductive Transducers: Tachometers, Linear Variable Differential Transducer (LVDT)

*Week Number 11:* Temperature and displacement sensors” Temperature measurement devices and their parameters, Thermistor and Thermometer.

*Week Number 12:* Photovoltaic theory of operation” Light intensity and definitions, Dark IV diode characteristics, Light absorption by semiconductors, Photomultiplier and photoconductive.

*Week Number 13:* Data acquisition system: signal conditioning circuit: buffering, filtering, signal level change, signal conversion, linearization and multiplexers.
Week Number 14: Analog to digital and digital to analog converter “Analog to digital conversion concept, Digital to analog conversion concept, Multiplexing, Interference problem solvers

Week Number 15: Computer controlled test” Introduction to computer control testing, Case study, Digital control and signal timing concept

Week Number 16: Final Exam.
Communication Courses

EC 321 - Signals and Systems

Course Information

Course Title: Signals and Systems.
Code: EC 321.
Hours: Lecture – 2 Hr.  Tutorial/Lab – 2/1 Hrs.  Credit – 3.
Prerequisite: BA 226, EE 231.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:

Introduction to communication theory. Fourier transform as a mathematical tool for spectral analysis. Sampling Theory, Convolution of continuous and discrete signals, Correlation, Concept of power and energy spectral densities and correlation between waveforms. Transmission through linear filters and channels. Hilbert transform and Positive pre-envelope and complex envelope. Response of LPF and BPF to signals.

Text Books:


Reference Books:

Alan V. Oppenheim “Signals and systems” Prentice Hall

Course Aim:

The course examines the concept of line spectrum as well as the continuous spectrum using FT. Additionally, it introduces the mathematical background required for the remainder of communication courses.

Course Objectives:

- To learn the concept of spectrum (line and continuous) using F.T
- To introduce the definition of convolution, and correlation.
- To introduce the definition of signal bandwidth, signal power and signal PSD.
- To learn the effect of linear system of signals.
**COURSE OUTLINE:**

*Week Number 1:* Introduction and types of signals and systems.

*Week Number 2:* Introduction to Fourier Transform

*Week Number 3:* Properties of Fourier Transform

*Week Number 4:* Time and frequency convolution

*Week Number 5:* F.T of special functions

*Week Number 6:* F.T of periodic signals

*Week Number 7:* Sampling Theory, discrete time signals, 7th week exam

*Week Number 8:* Convolution of discrete time signals and DFT

*Week Number 9:* Spectral density and Correlation (Auto, Cross) of power and energy signals

*Week Number 10:* Hilbert transform / Complex and natural envelope


*Week Number 12:* Conditions for distortion-less transmission through stable system.

*Week Number 13:* Impulse response of discrete-time system and discrete convolution – discrete correlation-Auto-correlation & Cross-correlation of discrete signals

*Week Number 14:* Ideal LPF filters in time and frequency domains

*Week Number 15:* Ideal BPF filters in time and frequency domains

*Week Number 16:* Final Exam.
EC 322 - Introduction to communication Systems

**COURSE INFORMATION**

Course Title: Introduction to communication Systems.

Code: EC 322.

Hours: Lecture – 2 Hr.  Tutorial/Lab – 2/2 Hrs.  Credit – 3.

Prerequisite: BA 323, EC 321.

**GRADING**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

**COURSE DESCRIPTION:**

Base band communication of Analog signals. FDM Concepts. Amplitude modulation, mathematical description and spectral characteristics of full carrier AM, DSB-SC, SSB-SC, and VSB. Multiplexing techniques (QAM and FDM). Angle modulation (FM and PM); generation and detection of CW modulation. Sampling theory and its practical aspects. PAM, Time Division multiplexing, TDM-PAM, PWM. And PPM generation and detection. Cross talk and channel bandwidth requirements, Baseband Digital Modulation: Pulse Coding modulation (PCM), DPCM and Delta Modulation (DM), Prediction

**TEXT BOOKS:**


**REFERENCE BOOKS:**

J. Proakis & M. Salehi “Communication System Engineering”

**COURSE AIM:**

To get the student familiar with different analog and digital communication systems: their block diagrams, modulators and demodulators, identify the difference between continuous and time discrete communications.

**COURSE OBJECTIVES:**

- To enable the student of identifying:
- Amplitude modulation, mathematical description and spectral analysis of DSB-TC, DSB-SC, VSB, QAM.
- Angle modulation, mathematical description, spectral analysis and modulation and demodulation
- Introducing sampling theorem and its practical aspects, time division multiplexing, pulse modulation and demodulation.
- Analog Pulse Modulation PAM, PWM, and PPM
- Baseband Digital Modulation: Pulse Coding Modulation (PCM), DPCM and Delta Modulation (DM). Prediction

**COURSE OUTLINE:**

**Week Number 1:** Revision. Introduction to communication systems. Linear Modulation / Exponential modulation. Digital modulation basics.

**Week Number 2:** Week Number 2: Linear Modulation: Amplitude modulation (AM) DSB-TC, DSB-SC, Vestigial Side band (VSB)


**Week Number 4:** Generation of SSB-SC: The frequency discrimination method. The phase discrimination method.

**Week Number 5:** Synchronous detection of Linear Modulation Signals. Effect of phase shift and frequency offset errors.

**Week Number 6:** Frequency Division multiplexing (FDM). QAM. Super heterodyne receivers

**Week Number 7:** Exponential Modulation: FM and PM mathematical analysis, sensitivity and modulation index. FM and PM single tone modulation. Bandwidth and power.

**Week Number 8:** Narrow band NBFM and WBPM. Phasor diagram. WBFM spectrum. Generation of FM. FM Armstrong generation. Detection of FM.

**Week Number 9:** Sampling theorem for low pass signals. Natural sampling relation to PAM. LPF reconstruction.

**Week Number 10:** Practical sampling (Flat top sampling), Reconstruction: S&H circuits. ZOH and FOH filters

**Week Number 11:** Number 11: Analog Pulse Modulation: PAM, PWM and PPM. Bandwidth and power.

**Week Number 12:** Generation of and Conversion among PAM, PWM and PPM. Time-Division Multiplexing (TDM) of PAM, PWM and PPM. BW of PAM.

**Week Number 13:** Baseband Digital Modulation: Pulse coding modulation (PCM), Quantization and coding. Basic PCM waveforms: RB, RZ and NRZ, Manchester code.

**Week Number 14:** Nonlinear PCM generation. Companding (μ-law PCM, A-law PCM)
Week Number 15: Differential Modulation: DPCM and Delta Modulation (DM), Prediction.

Week Number 16: Final Exam.
EC 421 - Statistical Communication Theory

Course Title: Statistical Communication Theory.

Code: EC 421.

Hours: Lecture – 2 Hr.  Tutorial/Lab – 2/2 Hrs.  Credit – 3.

Prerequisite: BA323, EC321.

Grading

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

Course Description:

Review of probabilities, R.V., characteristic function, joint R.V., correlation, independence - Random processes: Stationarity, Ergodicity with applications to line codes - AWGN channels and band-pass noise - AM/ FM with the presence of noise - Noise effect on analog pulse modulation - Noise effect on PCM.

Text Books:

Peyton Z. Peebles, Jr "Probability, Random Variables, and Random Signals"

Reference Books:

Couch “Digital and analog communication systems”

Course Aim:

To get the student familiar with practical analog and digital communication systems and their performance in the presence of noise.

Course Objectives:

To enable the student:

- Identify the importance of probability theory and stochastic processes in the communication systems.
- Revision of analog communication and measure their performance in the presence of noise taking randomness of messages into consideration and, SNR calculations for each of the possible detection methods of the analog communication systems.
Revisit the digital modulation system and measure their performance in the presence of noise

**COURSE OUTLINE:**

- **Week Number 1**: Review of probabilities, R.V., characteristics function, joint R.V., correlation, independence.
- **Week Number 2**: Transformation of random variables (cont.) + review of random processes
- **Week Number 3**: Random processes: Autocorrelation, PSD, Stationarity, Ergodicity
- **Week Number 4**: AWGN channels and band-pass noise- I-Q representation of Bandpass noise
- **Week Number 5**: Performance of Linear Modulation: Coherent detectors, AM noncoherent detection in the presence of noise.
- **Week Number 6**: Performance of Exponential Modulation in the presence of Noise: PM detection in the presence of noise FM performance in the presence of noise.
- **Week Number 7**: Optimum pre-emphasis and de-emphasis systems. Discrimination between NBFM and WBFM on noise performance basis.
- **Week Number 8**: Performance of Analog Pulse Modulation in the presence of Noise: PAM
- **Week Number 9**: Noise performance of PWM and PPM. Bandwidth noise reduction.
- **Week Number 10**: Quantization error. SQNR, Performance of PCM in the presence of Noise-Probability of Error.
- **Week Number 12**: Performance of PCM with Matched Filter receivers.
- **Week Number 13**: Power Spectral Density and spectral efficiencies of PCM waveforms.
- **Week Number 14**: Intersymbol Interference (ISI): Concept, and pulse shaping techniques: Nyquist pulse, raised cosine pulse, Duobinary signaling
- **Week Number 15**: Performance of FDM and TDM in noise.
- **Week Number 16**: Final Exam.
EC 422 - Introduction to Digital Communications

Course Title: Introduction to Digital Communications.

Code: EC 422.

Hours: Lecture – 2 Hr. Tutorial/Lab – 2/2 Hrs. Credit – 3.

Prerequisite: EC 421.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:

Bandpass data transmission - Gram Schmidt orthogonalization procedure, Geometric representation of signals in signal space - Noise effect in signal space, Decision regions and related probability of error - binary modulation techniques (CB-ASK, CB-FSK, CB-PSK) - Optimum FSK, MSK, Non-Coherent Detection, NC-FSK – DPSK

Text Books:

- Simon Haykin, "Digital Communication systems" John Wiley and Sons.

Reference Books:

P. Peebles, "Communication system principles".

Course Aim:

- To get students familiar with a different pass-band digital modulation systems taking the effect of noise into consideration
- To identify the probability of error, bit error rate, spectral properties.
- Design and Realize the transmitter and receiver of a specific digital communication system.
- Course Objectives:
  - Gram-Schmidt Orthogonalization procedure
  - Basic pass band modulation techniques: ASK, BPSK, BFSK.
  - Pass band modulation techniques.
  - Non-Coherent Detection.
**Course Outline:**

**Week Number 1:** Introduction to Pass band Modulation Techniques, Tx and Rx system, Signal Space (SS) techniques. Orthogonal bases functions. Geometric representation of signals.

**Week Number 2:** Distance, Correlation, Orthogonality. Relation to matched filter theory. Gram-Schmidt orthogonalization procedure.

**Week Number 3:** Decision rules, Decision boundaries, Decision regions. MAP and ML estimation. Bank of matched filters receivers. Probability of error calculations in presence of AWGN.

**Week Number 4:** Basic Bandpass modulation techniques, ASK, BPSK, and BFSK. SS representation. Time and frequency expressions.

**Week Number 5:** Coherent detection of ASK, OOK, BPSK, BFSK signals in presence of noise.

**Week Number 6:** BPSK, BFSK generation and detection

**Week Number 7:** Power Spectral Density (PSD) and Spectral efficiencies for ASK, BPSk, BFSK

**Week Number 8:** QPSK: SS-PSD-Spectral Efficiency, Generation of QPSK. OQPSK and π/4 QPSK

**Week Number 9:** Optimum FSK, MSK: Analysis, relation to OQPSK, generation, detection. GMSK

**Week Number 10:** M-ary Modulation Techniques: M-ary ASK, M-ary PSK

**Week Number 11:** M-ary Modulation Techniques: M-ary FSK, QAM

**Week Number 12:** Union Bound. Error performance of M-ary modulation.

**Week Number 13:** Non-Coherent Detection. Rayleigh and Rice distributions. Optimum NC detection. NC Matched filter.

**Week Number 14:** NC-FSK – DPSK generation, detection and Error performance

**Week Number 15:** Comparison of digital modulation techniques.

**Week Number 16:** Final Exam.
# EC 523 - Advanced Communication Systems

## Course Information

**Course Title:** Advanced Communication Systems  
**Code:** EC 523  
**Hours:** Lecture – 2 Hr.  
**Tutorial/Lab – 2/2 Hrs.**  
**Credit – 3.**  
**Prerequisite:** EC 422

## Grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Weightage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Performance/Attendance:</td>
<td>10</td>
</tr>
<tr>
<td>Midterm # 1/Assignments – (7th Week):</td>
<td>30</td>
</tr>
<tr>
<td>Midterm # 2/Assignments – (12th Week):</td>
<td>20</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40</td>
</tr>
</tbody>
</table>

## Course Description:

Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA). OFDM, OFDMA- Examples of FDMA, TDMA, and CDMA systems, and their applications.

## Text Books:

Don Torrieri "Principles of Spread-Spectrum Communication Systems", Springer

## Reference Books:

- Wozincraft and Jacobs, "Principles of communication Engineering".
- Martin S. Roden, "Digital and data communication systems".
- Micha Schwartz, "Information transmission, modulation and noise".

## Course Aim:

To get the students familiar with the spread spectrum multiple access techniques (FDMA, TDMA and CDMA techniques) and its applications. Also, to get familiar with multi-carrier techniques.

## Course Objectives:

- Theory and systems of wireless communication systems.  
- Multiple access techniques (FDMA, TDMA, and CDMA)  
- Orthogonal Frequency Division Multiplexing (OFDM) as a multi-carrier technique.
COURSE OUTLINE:

Week Number 1: Introduction to Multiplexing and Multiple-access techniques in Communication Systems

Week Number 2: FDM and FDMA Techniques

Week Number 3: FDMA Performance and capacity

Week Number 4: Examples of FDMA Communication Systems

Week Number 5: TDM and TDMA Techniques

Week Number 6: TDMA Performance and capacity

Week Number 7: Examples of TDMA Communication Systems

Week Number 8: Spread Spectrum Techniques

Week Number 9: Spreading Codes - M-Sequences - Gold Codes

Week Number 10: CDM and CDMA Techniques

Week Number 11: CDMA Performance and capacity

Week Number 12: Comparisons of FDMA, TDMA and CDMA

Week Number 13: Examples of CDMA Communication Systems

Week Number 14: Multicarrier, OFDM and OFDMA Techniques

Week Number 15: Examples of OFDMA Communication Systems

Week Number 16: Final Exam.
Communication Elective Courses

**EC 520 - Satellite Communications**

**COURSE INFORMATION**

Course Title: Satellite Communication.

Code: EC 520.


Prerequisite: EC 422.

**GRADING**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

**COURSE DESCRIPTION:**

Orbits and Earth Coverage: Orbital parameters-circular and elliptical orbits-GEO,MEO,LEO. Link budget, atmospheric Losses- frequency bands. Satellite construction (payload, platform)- Radio system technology (Multiple Access Techniques. Antennas. Mobile satellite communication systems. Direct satellite broadcasting , VSAT) – Channel coding techniques

**TEXT BOOKS:**

G. Maral, M. Bousquet, "Satellite Communication systems", John Wiley & sons

**REFERENCE BOOKS:**

T. Pratt, C. W. Bostian, "Satellite Communications", John Wiley & Sons

**COURSE AIM:**

To give an overall view on the different aspects concerning the satellite on a communication system.

**COURSE OBJECTIVES:**

To describe different types of satellite orbits, to address the limitations and capabilities of the satellite communication system and to review different types of satellite communication systems.
**COURSE OUTLINE:**

*Week Number 1:* Introduction to satellite communications (historical background, comparison between terrestrial and satellite links, advantages and limitations of satellite communication, types of satellite services.

*Week Number 2:* Satellite Orbits (Orbital parameters, circular orbits, Keller laws, elliptical orbits)

*Week Number 3:* Satellite Orbits “Cont.” (GEO orbits calculations, MEO and LEO orbits) – Satellite Link (Link budget, atmospheric losses)

*Week Number 4:* Satellite Link “Cont.”(frequency bands, polarization effects) – Satellite Construction (platform)

*Week Number 5:* Satellite Construction (payload “transponder”)

*Week Number 6:* Satellite Construction (payload “Antennas”)

*Week Number 7:* Radio System Technology (Multiple Access techniques “FDMA, SCPC, Guardbands and crosstalk”)

*Week Number 8:* Radio System Technology (TDMA “Frame structure, synchronization, frame design”)

*Week Number 9:* Radio System Technology (CDMA “DS-CDMA, FH-CDMA”)

*Week Number 10:* Earth Stations

*Week Number 11:* Fixed Satellite Services

*Week Number 12:* Mobile Satellite Communications (INMARSAT, ICO, VSAT)

*Week Number 13:* Satellite Communication (Direct satellite broadcasting)

*Week Number 14:* Channel coding techniques: Linear Block codes

*Week Number 15:* Convolutional codes

*Week Number 16:* Final Exam.
EC 521 - Communication Networks

COURSE INFORMATION

Course Title: Communication Networks.
Code: EC 521.
Prerequisite: EC 422.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:


TEXT BOOKS:


REFERENCE BOOKS:

SUPPLEMENTARY MATERIALS:

OpNet Education Software

COURSE AIM:

This course aims at providing an overview of the field of communication networks. It emphasizes basic principles and topics of fundamental importance concerning the technology and architecture of this field, as well as providing a detailed discussion of leading-edge topics. In other words, this course is intended to give a working knowledge of how telecommunications networks are constructed, how they operate, and how they are optimized to fulfill a particular need.

COURSE OBJECTIVES:

After completing the readings and written assignments, and viewing the lessons, the students should be able to:
Identify major applications of networking.

Describe the internetworking equipment.

Learn about data communication protocols.

**COURSE OUTLINE:**

*Week Number 1:* Basic Concepts of a Network

*Week Number 2:* Physical Layer

*Week Number 3:* Internet Protocol and subnetting

*Week Number 4:* Network address translation protocol and IPv6

*Week Number 5:* Routing algorithms

*Week Number 6:* Routing standards

*Week Number 7:* Local Area Network topologies

*Week Number 8:* Continue: Local Area Network topologies

*Week Number 9:* Wireless LANs

*Week Number 10:* Networking and Internetworking Devices

*Week Number 11:* VOIP

*Week Number 12:* Transport Layer

*Week Number 13:* Continue: Transport Layer

*Week Number 14:* New trends in networking

*Week Number 15:* Revision

*Week Number 16:* Final Exam.
EC 522 - Acoustics

Course Information

Course Title: Acoustics.
Code: EC 522.
Prerequisite: EC 341.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:

Acoustic wave and velocity of sound - The one-dimensional wave equation - Impedance of mediums - Three-dimensional wave equation and spherical wave - Sound intensity and power - Energy density and levels - Multiple sources and loudness - Environmental acoustics - Equivalent sound pressure level and assessment of noise - Analogy between acoustical and electrical circuits - Transducers and sensitivity of MICs and loudspeakers - Hi-fi system and introduction of underwater acoustics - Velocity profiles and SONAR

Text Books:

Frey Kensiler, "Fundamentals of acoustics".

Course Aim:

The course aims to get the students familiar with the concept and the nature of the acoustic wave, Also the features of the acoustical waves, discusses its propagation, reception, and effects.

Course Objectives:

- Describe the nature of the acoustic wave equation and its solutions.
- Define the acoustic power and energy.
- Define the sound levels.
- Describe the environmental acoustics.
- Define the Electro-acoustic transducers.
- Describe the underwater acoustics.
COURSE OUTLINE:

**Week Number 1:** Acoustic wave and velocity of sound: Velocity of sound in air and water and metal.

**Week Number 2:** The one-dimensional wave equation / Impedance of mediums: The one-dimensional wave equation Condensation.

**Week Number 3:** Solution of the one dimensional wave equation: The general solution of the one dimensional wave equation Definition of impedance’s. Freely traveling plane wave.

**Week Number 4:** Three-dimensional wave equation and spherical wave: 3D wave equation, The spherical wave equation and freely traveling spherical wave.

**Week Number 5:** Sound intensity and power, Impedance of the freely traveling spherical wave, Intensity, power, energy density, levels and loudness.

**Week Number 6:** Energy density and levels: Acoustic power and directivity, Energy density.

**Week Number 7:** Multiple sources and levels (power, intensity), Multiple sources, Loudness.

**Week Number 8:** Environmental acoustics: Environmental acoustics; weighted SPL.

**Week Number 9:** Equivalent SPL and assessment of noise: Combination of levels, Assessment of noise, Leq , Ld , Ln , Ldn.

**Week Number 10:** Analogy between mechanical and electrical circuits: Introduction, Mechanical circuit elements, Analogy between mechanical and electrical circuits.

**Week Number 11:** Analogy between mechanical and electrical circuits: Velocity of sound in air and water and metal, Analogy between acoustical and electrical circuits.

**Week Number 12:** Acoustical resonators and filters: Acoustical resonator and filters, Transducer.

**Week Number 13:** Transducers and sensitivity of microphones and Speakers: Sensitivity and types of mics, Efficiency and types of Loudspeakers, hi-fi multispeaker system.

**Week Number 14:** Hi-fi system and underwater acoustics: Introduction to underwater acoustics, Velocity of sound in seawater, Sound transmission loss in seawater.

**Week Number 15:** Velocity profile and SONAR: Thermocline and velocity profiles, Refraction of sound in seawater, SONAR.

**Week Number 16:** Final Exam.
EC 524 - Optical Communications

COURSE INFORMATION

Course Title: Optical Communications.

Code: EC 524.


Prerequisite: EC 422.

GRADING

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

COURSE DESCRIPTION:


TEXT BOOKS:


REFERENCE BOOKS:

Gerd Keiser, "Optical Fiber Communications".

COURSE AIM:

The course introduces the principal components in the optical communication system, including: optical fibers, light sources, optical amplifiers and light detectors. It also introduces optical transmission and reception. The course plans to construct an adjusted a high capacity and minimum loss optical communication system using different multiplexing techniques.

COURSE OBJECTIVES:

- Theory of light propagation in optical fibers with different types.
Overview of Opto-electronic device requirements for communication systems, including light sources, optical amplifiers and light detectors.

Adjustment of a complete optical communication system.

**Course Outline:**

*Week Number 1:* Historical development: Historical background on communications, communication channels, light sources and detectors. General optical communication system. Advantages of optical fiber communications.


*Week Number 3:* Electromagnetic theory for optical propagation – Normalized frequency of the optical fiber - Linearly polarized modes in optical fibers.


*Week Number 5:* Transmission Characteristics in Optical Fibers: Dispersion: definition and types – Bit rate calculation – Material and Waveguide Dispersion.

*Week Number 6:* Dispersion modified single-mode optical fibers - Intramodal dispersion – Overall dispersion.

*Week Number 7:* Fiber Fabrication – Fiber Cable Design – Fiber Connection: Couplers.


*Week Number 9:* Optical Sources: Requirements of light sources - Concept of light emission – spontaneous emission – stimulated emission – LED operation.

*Week Number 10:* Laser: Operation and types - Injection laser diode – Optical source limitations.

*Week Number 11:* Wavelength Converter – Optical Amplifiers.

*Week Number 12:* Light Detectors: Requirements - Photodetectors: Quantum efficiency and responsivity photodiodes.

*Week Number 13:* Optical Transmitter and Receiver: Optical transmitter circuits Optical receiver circuits.

*Week Number 14:* Optical fiber systems: Devices requirement, Optical fiber communication systems - Digital system, planning consideration.


*Week Number 16:* Final Exam.
EC 525 - Information Theory and Coding

Course Title: Information Theory and Coding.
Code: EC 525.
Prerequisite: EC 523.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:

Review of probability theory - Concept of information theory and coding - Average information & Entropy – Mutual information - Channel capacity - Bandwidth and S/N of a channel - Source Coding - Channel Coding Theorem - Linear block codes - Convolutional codes - Viterbi decoding - Turbo Codes - Iterative decoding - Performance of different coded modulation in AWGN channels.

Text Books:


Reference Books:

Simon Haykin, "communication Systems", John Wiley and Sons, 2001

Course Aim:

The course introduces the concept and basics of information theory and the basics of source and channel encoding/decoding.

Course Objectives:

- Understand the key modules of digital communication system.
- Understand the meaning of entropy, Self and mutual Information.
- Understand and practice the design of source encoding and decoding.
- Understand and practice the design of the channel encoding and decoding.
<table>
<thead>
<tr>
<th>Week Number 1:</th>
<th>Course outline and Review of probability theory - Concept of information theory and coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week Number 2:</td>
<td>Average information &amp; Entropy – Joint Entropy and Conditional Entropy – Self and Mutual information</td>
</tr>
<tr>
<td>Week Number 3:</td>
<td>Channel capacity - Time rate of information - Capacity of the Binary Symmetric Channel - More Examples on capacity of Discrete channels.</td>
</tr>
<tr>
<td>Week Number 4:</td>
<td>Continuous channels - Entropy of continuous sources - Entropy maximization - Gaussian sources - Shannon’s formula for capacity.</td>
</tr>
<tr>
<td>Week Number 5:</td>
<td>Bandwidth and S/N of a channel -- Shannon- Hartely theorem of the capacity of AWGN channels.</td>
</tr>
<tr>
<td>Week Number 6:</td>
<td>Source Coding: Universal Codes and Arithmetic Coding - Lossy and Lossless coding - Run Length Coding (RLC).</td>
</tr>
<tr>
<td>Week Number 7:</td>
<td>Variable Length Coding- Huffman coding.</td>
</tr>
<tr>
<td>Week Number 8:</td>
<td>Channel Coding Theorem: Preview, Definitions, and Jointly typical sequences.</td>
</tr>
<tr>
<td>Week Number 11:</td>
<td>Convolutional codes- State diagram-Trellis diagram.</td>
</tr>
<tr>
<td>Week Number 12:</td>
<td>Viterbi decoding</td>
</tr>
<tr>
<td>Week Number 13:</td>
<td>Viterbi decoding (Continue) – MAP decoding of Convolutional Codes.</td>
</tr>
<tr>
<td>Week Number 14:</td>
<td>Turbo Codes. Iterative decoding.</td>
</tr>
<tr>
<td>Week Number 15:</td>
<td>Performance of different coded modulation in AWGN channels.</td>
</tr>
<tr>
<td>Week Number 16:</td>
<td>Final Exam.</td>
</tr>
</tbody>
</table>
**EC 526 - Mobile communications**

**Course Information**

Course Title: Mobile Communications.

Code: EC 526.


Prerequisite: EC 422.

**Grading**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Performance/Attendance</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm # 1/Assignments – (7th Week)</td>
<td>30%</td>
</tr>
<tr>
<td>Midterm # 2/Assignments – (12th Week)</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Course Description:**

Difference between conventional mobile and cellular mobile  - Overview on different cellular generations - Cellular radio design principles - Concept of frequency reuse/cellular block diagram - Co channel interference/adjacent channel interference - Multipath propagation - Speech coding in GSM - Channel coding and interleaving in GSM - GSM mobile station block diagram - Multiple access techniques - Control channels in GSM - Location updating \ security management.

**Text Books:**


**Supplementary Materials:**

MATLAB “Simulink and Communications toolbox”

**Course Aim:**

The course is aimed at providing the fundamentals of mobile and cellular communications starting from an overview over the different mobile generations. The system design, cell capacity and blocking probability are considered. The problem of the mobile communication channel and the path loss calculation are given. The system structure and the function of each element are described. Multiple Access Techniques- channel coding in mobile communication Frequency Reuse – cell cluster concept – co channel and adjacent channel interference – cell blocking – cell splitting and delay at the cell site.

**Course Objectives:**

- Fundamentals of mobile and cellular communications
System design, cell capacity and blocking probability
Multiple Access Techniques- channel coding in mobile communication Frequency Reuse – cell cluster concept.

COURSE OUTLINE:

Week Number 1: Difference between conventional mobile and cellular mobile
Week Number 2: Channel trunkings needs and blocking probability
Week Number 3: Overview on different cellular generations
Week Number 4: Cellular radio design principles
Week Number 5: Concept of frequency reuse/cellular block diagram
Week Number 6: Co channel interference/adjacent channel interference
Week Number 7: Continue: Co channel interference/adjacent channel interference
Week Number 8: Multipath propagation and mobile communication channel problems
Week Number 9: Speech coding in GSM
Week Number 10: Channel coding and interleaving in GSM
Week Number 11: Continue: Channel coding and interleaving in GSM
Week Number 12: GSM mobile station block diagram
Week Number 13: Multiple access techniques
Week Number 14: Control channels in GSM
Week Number 15: Location updating\security management
Week Number 16: Final Exam.
EC 527 - Applied Telecommunications

Course Information

Course Title: Applied Tele-communications.
Code: EC 527.
Prerequisite: EC322.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:
Introduction to radar system - Classification and principles of the radar system - The radar equation - Probability of detection - The digital radar, terminals, transmission and switching. Analog and Digital telephone networks.

Text Books:

Reference Books:

Course Aim:
The course describes the concept, design and analysis of applied communication systems (radar & telephony) to achieve the optimum performance.

Course Objectives:
Develop the basic concept of communication systems as radar systems and analog and digital telephony from design and analysis point of view.

Course Outline:

Week Number 1: Introduction: Definition and types of radar systems; advantages of using the radar systems in vision and detection of targets; construction of radar systems as a communication system block diagram.
Week Number 2: The radar equation: Radar equation and the mathematical proof, effect of each parameter in the radar equation, operation and testing of real radar system & Classification of radar systems: Principle of operation, operating frequency bands, function of radar systems.

Week Number 3: The target cross-section: Definition of target cross-section, methods of measuring target cross-section RCS.

Week Number 4: Noise and Probability of detection, probability of false alarm, power supply circuit description.

Week Number 5: Radar Integration.

Week Number 6: Sea augmented targets detection.

Week Number 7: Sea augmented targets detection - Training on real radar system

Week Number 8: Introduction to Doppler and MTI radar.

Week Number 9: Staggered p.r. frequencies.

Week Number 10: Digital MTI processing

Week Number 11: Limitation to MTI performance

Week Number 12: Analog telephony network

Week Number 13: Continue: Analog telephony network

Week Number 14: Digital telephony network (mobile)

Week Number 15: Real radars (a visit to radar simulator)

Week Number 16: Final Exam.
EC528 - Data Communications

Course Title: Data Communications.

Code: EC 528.


Prerequisite: EC 422.

Grading

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

Course Description:
This course covers the fundamental issues impacting all data networks and reviews virtually most of the important new standard and technological development, offering especially comprehensive coverage of the physical layer and packet switching techniques.

Text Books:

Behrouz Forouzan, "Data Communications and Networking" McGraw- Hill

Course Aim:

To enable the students to learn the techniques of data signal processing and protocols

Course Objectives:

- Physical and data link layer
- Packet switching techniques.
- Medium access control techniques

Course Outline:

Week Number 1: Introduction

Week Number 2: Data Communication

Week Number 3: Data Encoding

Week Number 4: Digital data communication technique
Week Number 5: Data link control
Week Number 6: Error control mechanisms
Week Number 7: Flow control mechanisms
Week Number 8: Circuit switching
Week Number 9: Packet switching
Week Number 10: HDLC protocol
Week Number 11: CSMA-CD
Week Number 12: CSMA-CA
Week Number 13: Congestion control
Week Number 14: Spread spectrum techniques
Week Number 15: Review
Week Number 16: Final Exam.
EC 529 - Modern Wireless Communications

**Course Information**

**Course Title:** Modern Wireless Communications.

**Code:** EC 552.

**Hours:** Lecture – 2 Hr.  Tutorial– 2 Hrs.  Credit – 3.

**Prerequisite:** EC 422.

**Grading**

- Class Performance/Attendance: 10%
- Midterm # 1/Assignments – (7th Week): 30%
- Midterm # 2/Assignments – (12th Week): 20%
- Final Exam 40%

**Course Description:**


**Text Books:**


**Supplementary Materials:**

MATLAB “Simulink and Communications toolbox”

**Course Aim:**

This course covers the fundamental issues impacting all wireless networks and reviews virtually most of the important new wireless standard and technological development, offering especially comprehensive coverage of the spread spectrum multiple access techniques and its applications in 2G and 3G mobile systems and wireless local area networks (WLAN).

**Course Objectives:**

- Theory and systems of wireless communication systems.
- WLAN concept and theory.
- Multiple access techniques.
COURSE OUTLINE:

Week Number 1: Introduction to mobile and wireless systems.

Week Number 2: Frequency division multiple access (FDMA), cellular concept, and 1 G mobile systems.

Week Number 3: multipath propagation and radio capacity of cellular systems.

Week Number 4: GSM and time division multiple access (TDMA) systems

Week Number 5: GSM transceiver and network architecture.

Week Number 6: code division multiple access (CDMA) concept and capacity

Week Number 7: spreading sequences: Walsh orthogonal codes and PN codes

Week Number 8: IS-95 forward link and reverse links

Week Number 9: High speed packet access (HSPA) evolution and WCDMA

Week Number 10: multicarrier and Orthogonal frequency division multiplexing (OFDM) concept

Week Number 11: User multiplexing in OFDM (OFDMA)

Week Number 12: Frequency domain model of OFDM and channel estimation

Week Number 13: WiMax frame structure, transmitter and receiver structures

Week Number 14: MIMO, diversity, and beamforming in OFDM

Week Number 15: Long term Evolution (LTE) physical layer

Week Number 16: Final Exam.
EC 550 - Selected Topics in Communications

Course Information

Course Title: Selected topics in Communications.
Code: EC 550.
Prerequisite: EC422.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:


Text Books:

Shinsuke Hara and Ramjee Prasad, "Multicarrier Techniques for 4G Mobile Communication", Artech House

Course Aim:

The aim of this course is to get the students familiar with the OFDM technique, and be able to construct an OFDM system that meets certain requirements. The course introduces the Bluetooth technology with all its aspects. Also, it covers UWB properties, generation and channel modeling and the design of UWB transmitter and receiver.

Course Objectives:

OFDM technique with all its aspects and DVB as an application. Bluetooth technology: Basic concepts - Protocol Architecture - Encryption & Security - Link Management - Logical link control UWB properties, generation and channel modeling and the design
COURSE OUTLINE:

Week Number 1: Characteristics of Multipath Fading Channels

Week Number 2: Principle and History of MCM/OFDM: The concept of multicarrier transmission - OFDM as multicarrier transmission

Week Number 3: Implementation of OFDM by FFT - OFDM with guard interval (Cyclic Prefix)

Week Number 4: OFDM Characteristics: Bit Error Rate in AWGN Channel - Bit Error Rate of CPSK-Based OFDM System in Rayleigh Fading Channels

Week Number 5: Bit Error Rate of DPSK-Based OFDM System in Rayleigh Fading Channels - Bit Error Rate in Frequency Selective and Time Selective Rayleigh Fading Channels

Week Number 6: Optimum Number of Subcarriers and Optimum Length of Guard Interval

Week Number 7: Applications of OFDM: Digital Audio Broadcasting - Terrestrial Digital Video Broadcasting

Week Number 8: Basic concepts of Bluetooth - Protocol Architecture

Week Number 9: Encryption & Security of Bluetooth

Week Number 10: Bluetooth Link Management - Logical link control

Week Number 11: Simulation of a Bluetooth system

Week Number 12: Ultra Wideband: Basic properties of UWB signals and systems

Week Number 13: Generation of UWB - UWB channel modeling

Week Number 14: UWB Communications - Modulation methods for UWB

Week Number 15: UWB Transmitter - UWB Receiver

Week Number 16: Final Exam.
EC 551 - Telecommunication System Engineering

Course Information

Course Title: Telecommunication System Engineering.
Code: EC 551.
Prerequisite: EC 422.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:

Principles, Technologies, system architectures, standards of GSM, GPRS, UMTS, WLAN, 802.16 and WiMAX - QoS in telecommunication systems - Internet Telephony - Resource allocation and management - Sensor networks

Text Books:

Martin Sauter, "Communication Systems for the Mobile Information Society"

Course Aim:

To give an overall view on the different aspects concerning the telecommunication systems including Principles, Technologies, system architectures, standards, and market issues

Course Objectives:

Address the concept of system architecture level. It targets the layering model and management of telecommunication systems practically available in the world.

Course Outline:

Week Number 1: GSM - The Signaling System Number 7 - The GSM Subsystems - The Network Subsystem - The Base Station Subsystem (BSS).

Week Number 2: GSM - Mobility Management and Call Control - The Mobile Station - The SIM card - The Intelligent Network Subsystem and CAMEL - Questions.

Week Number 4: GPRS - GPRS Interfaces – GPRS Services


Week Number 7: WLAN - The MAC Layer - The Physical Layer - Wireless LAN Security - Comparison of Wireless LAN and UMTS

Week Number 8: 802.16 and WiMAX

Week Number 9: Security - Advanced 802.16 Functionalities - Mobile WiMAX: 802.16e - WiMAX Network Infrastructure - Comparison of 802.16 with UMTS, HSDPA and WLAN

Week Number 10: QoS in telecommunication systems

Week Number 11: IP networking


Week Number 13: Internet Telephony

Week Number 14: Resource allocation and management

Week Number 15: Sensor networks

Week Number 16: Final Exam.
EC 553 - Media and Entertainment Engineering

**COURSE INFORMATION**

Course Title: Media & Entertainment Engineering.

Code: EC 553.


Prerequisite: EC 322, EC434.

**GRADING**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

**COURSE DESCRIPTION:**

Stereophonic broadcasting systems - TV scanning and broadcasting - Detailed block diagram of a TV transmitter and receiver - Color TV fundamentals - NTSC, PAL, and SECAM systems - Digital TV - HDTV and Satellite TV - Audio recording analog and digital - Compact disc and CD player - Reflection and ray tracing theory - Acoustical treatment and studio design

**TEXT BOOKS:**

A. Luther & A. Inglis, Video Engineering, Mc. Graw Hill, 2002

**SUPPLEMENTARY MATERIALS:**

- Frequency bands.
- Color systems.
- TV standards.
- Digital TV standards.
- Audio and video recording standards.

**COURSE AIM:**

To understand the broadcasting transmission and reception systems for audio and video, as well as storage techniques. The studio design is also to be studied.

**COURSE OBJECTIVES:**

- Theory and systems of broadcasting for audio and video.
- Analog and digital recording for audio and video.
- Room acoustics and studio design.
COURSE OUTLINE:

Week Number 1: Introduction.

Week Number 2: AM and FM Transmitters: RF Transmission (low level & high level modulation) AM/FM.

Week Number 3: AM and FM reception: Broadcasting AM receiver, Broadcasting FM receiver.

Week Number 4: Stereophonic broadcasting systems: Stereophonic Transmitter and receiver, Television broadcasting (introduction and block diagram).

Week Number 5: TV scanning and broadcasting.

Week Number 6: Detailed block diagram of a TV transmitter and receiver.

Week Number 7: Color TV fundamentals: Color TV fundamentals.

Week Number 8: NTSC, PAL, and SECAM systems: PAL system, SECAM system, NTSC color system.

Week Number 9: Digital TV.

Week Number 10: HDTV and Satellite TV

Week Number 11: Audio recording analog and digital.

Week Number 12: Video Tape recording.

Week Number 13: Compact disc and CD player: Gramophone plate, Compact disc, CD player.

Week Number 14: Reflection and ray tracing theory: Reflection in a room, Ray tracing and image source theory, Reverberation theory.

Week Number 15: Acoustical treatment and studio design: Acoustical treatment for concert halls and studio design.

Week Number 16: Final Exam
Electronics Courses

EC 233 - Electronic Devices (1)

COURSE INFORMATION

Course Title: Electronic Devices (1).
Code: EC 233.
Prerequisite: EC 210.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

P-N junction diode, current components, junction capacitance, junction diode as a circuit element, special types of P-N junctions. P-N junction diodes, current components, junction capacitance, junction diode as a circuit element.

TEXT BOOKS:


REFERENCE BOOKS:


COURSE AIM:

To introduce students to Semiconductor junction diodes, rectifiers and other special types and applications.

COURSE OBJECTIVES:

P-N junction diode as a device, P-N junction as a circuit element, Special types of p-n junction diodes, Optoelectronic devices.

COURSE OUTLINE:

Week Number 1: Revision
Week Number 2: Intrinsic and extrinsic semiconductors. Trivalent or pentavalent dopents, Conductance

Week Number 3: Density of states. Electron and Hole distribution in semiconductors using Fermi level distribution. Free carrier density in terms of mixed dopant density.


Week Number 5: Capacitive effect of a P-N junction. Determination of the maximum electric filed. Width of the depletion layer. Determination of the junction capacitance for both types.


Week Number 7: 7th Week exam

Week Number 8: P-N junction characteristics. Low and high injection currents. Series resistance. Shunt resistance. Saturation current.

Week Number 9: P-N junction diode as a circuit element. Half wave and full wave rectifiers. Clipping circuits, Clamping circuits. Average output voltage.

Week Number 10: Breakdown mechanisms. Zener diode and applications.

Week Number 11: Varactors. The effect of doping profile on the characteristics. Application in tuning circuits.

Week Number 12: Switching diodes, switching speed, metal-semiconductor junctions, and Schotky diodes.


Week Number 14: Sources of light. Types of light: white, monochromatic and coherent. Light emitting diode (LED) properties, construction and operation. Semiconductor laser properties, construction, and operation: comparison and the use of each.


Week Number 16: Final Exam.
EC 332 - Electronic Devices (2)

Course Title: Electronic Devices (2)

Code: EC 332.

Hours: Lecture – 2 Hr.  Tutorial/Lab – 2/2 Hrs.  Credit – 3.

Prerequisite: EE 232, EC 233.

Grading

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

Course Description:


Text Books:


Reference Books:


Course Aim:


Course Objectives:

Studying theoretically and experimentally both transistor types:
B. SC. PROGRAM STATUS REPORT 2009

- BJT: Bipolar junction transistor.
- FET: Field effect transistor.
- Studying theoretically the 4 layer devices (Thyristors).

COURSE OUTLINE:

Week Number 1: Operation of BJT
Week Number 2: Biasing Methods
Week Number 3: Biasing Methods Cont’d – BJT Base Width Modulation
Week Number 4: AC Equivalent Circuits of BJT
Week Number 5: Common Emitter, Collector, and Base Amplifiers
Week Number 6: BJT as a Switch
Week Number 7: Operation of JFET – DC and AC Analysis
Week Number 8: MOS-Structure, Operation of MOSFET
Week Number 9: Depletion/Enhancement Mode MOSFETs, DC Analysis of MOSFET
Week Number 10: Channel Length Modulation, Body Effect, and MOSFET Capacitances
Week Number 11: AC Equivalent Circuits of MOSFET
Week Number 12: Common Source, Drain, and Gate Amplifiers
Week Number 13: MOSFETs Amplifiers using Active Loads
Week Number 14: Schockley, Diac, SCR, Triac Circuits
Week Number 15: UJT and PUT Circuits
Week Number 16: Final Exam.
EC 333 - Electronic Amplifiers

COURSE INFORMATION

Course Title: Electronic Amplifiers.
Code: EC 333.
Hours: Lecture – 2 Hr. Tutorial/Lab – 2/2 Hrs. Credit – 3.
Prerequisite: EC332, EC217.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

Revision on Single Stage BJT Amplifiers - Cascode - MOSFET Common Source, Source Follower and Common Gate Amplifier – MOSFET Cascode and Folded Cascode Amplifier - Frequency Response of MOSFET Circuits - Feedback Amplifiers - Feedback Topologies - Stability - Ring Oscillator and LC Oscillators - Voltage Controlled Oscillators - Power Amplifier - Tuned Amplifiers

TEXT BOOKS:

- Electronics Lab Manual, H.All, AAST

REFERENCE BOOKS:


COURSE AIM:

To introduce students to the theory and design of electronic amplifiers and oscillators for different applications and different frequency ranges.

COURSE OBJECTIVES:

- Analysis and design of all types of electronic amplifiers and oscillators.
- Introducing the concept of the feedback in amplifiers.
- Verifying measured amplifier response through computer simulation and Lab experiment.
COURSE OUTLINE:

**Week Number 1:** Revision on Single Stage BJT Amplifiers

**Week Number 2:** MOSFET Amplifier Configurations (Common Source Amplifier) – IC Environment

**Week Number 3:** MOSFET Amplifier Configurations (Common Drain and Gate Amplifier)

**Week Number 4:** Cascode and Folded Cascode Amplifier

**Week Number 5:** Frequency Response of MOSFET Circuits

**Week Number 6:** Frequency Response of BJT Circuits

**Week Number 7:** Feedback Amplifiers, Types, Effects

**Week Number 8:** Analysis of Feedback Amplifiers Topologies

**Week Number 9:** Stability of Feedback amplifiers, Nyquest Criterion Frequency Compensation

**Week Number 10:** Oscillators (Ring Oscillator and LC Oscillators)

**Week Number 11:** Oscillators (RC Oscillators and Voltage Controlled Oscillators)

**Week Number 12:** Power Amplifier (Definitions, Classes of operation, Class A)

**Week Number 13:** Power Amplifier (Push-Pull and Complementary Symmetry Class B/AB)

**Week Number 14:** Tuned Amplifiers (Single, Synchronous Tuned, Stagger Tuned)

**Week Number 15:** Revision

**Week Number 16:** Final Exam
EC 334 - Analog- and Digital- Circuits Analysis

COURSE INFORMATION

Course Title: Analog-and Digital Circuit Analysis.
Code: EC 334.
Prerequisite: EE 232.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:


TEXT BOOKS:


REFERENCE BOOKS:


COURSE AIM:

To be familiar with circuit synthesis techniques, circuit analysis and logic gates.

COURSE OBJECTIVES:

Synthesis of single and two-port networks. Analysis of networks and electronic circuits using standard packages. Analysis of different logic gates (RTL, DTL, TTL, CMOS)
COURSE OUTLINE:

Week Number 1: Course Overview, Review of basic circuit theorems (Thevenin's, Norton, and Milliman), Maximum Power Transfer Principal, and Laplace Transform.

Week Number 2: Two-Port Networks, The transfer function, Poles and Zeros, Describing matrices.

Week Number 3: Frequency, Phase and Time Responses

Week Number 4: Bode Plot, Input and Output Impedance, Phase and Group Delays.

Week Number 5: Computer-Aided Analysis Packages (Pspice, Microcap, EWB).

Week Number 6: Integrated Digital Logic Families, Definitions (Propagation Delay, Fan-in, Fan-out)

Week Number 7: Diode Switching, Transistor Switching

Week Number 8: RTL, DTL, TTL Logic Families

Week Number 9: Analysis of TTL gates.

Week Number 10: ECL Family and Examples

Week Number 11: CMOS Digital Circuits and Logic Families Comparison

Week Number 12: CMOS Inverter – Static Characteristics

Week Number 13: CMOS Inverter – Dynamic Characteristics

Week Number 14: CMOS Realization of Boolean Expressions (Compound Gates)

Week Number 15: CMOS VLSI Realization Aspects in Combinational Circuits

Week Number 16: Final Exam
EC 432 - Microelectronic Circuits

COURSE INFORMATION

Course Title: Microelectronic Circuits.

Code: EC 432.

Hours: Lecture – 2 Hr. Tutorial/Lab – 2/2 Hrs. Credit – 3.

Prerequisite: EC 333.

GRADING

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

COURSE DESCRIPTION:

Differential Amplifiers - Current Mirrors - Noise in Electronic Circuits - Operational Amplifiers - Phase Locked Loops - Switched Capacitor Circuits - IC Fabrication Steps

TEXT BOOKS:


REFERENCE BOOKS:


COURSE AIM:

The student should be familiar with the processes used in manufacturing monolithic IC’s, to design and analyze circuits based on analog integrated circuits.

COURSE OBJECTIVES:

The student should be familiar with the following topics:

- Integrated circuit technology
- Linear Integrated circuits: Operational amplifiers and their applications
- IC fabrication.
### COURSE OUTLINE:

<table>
<thead>
<tr>
<th>Week Number</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MOSFET Differential Amplifiers</td>
</tr>
<tr>
<td>2</td>
<td>BJT Differential Amplifier Stage (Concepts)</td>
</tr>
<tr>
<td>3</td>
<td>MOSFET Current Sources</td>
</tr>
<tr>
<td>4</td>
<td>BJT Current Sources</td>
</tr>
<tr>
<td>5</td>
<td>MOSFET / BJT Current Mirror (Concepts)</td>
</tr>
<tr>
<td>6</td>
<td>Noise in Electronic Circuits</td>
</tr>
<tr>
<td>7</td>
<td>Noise in Single-Stage Amplifier and Differential Pair</td>
</tr>
<tr>
<td>8</td>
<td>Ideal Operational Amplifiers Characteristics and Applications</td>
</tr>
<tr>
<td>9</td>
<td>Operational Amplifiers applications</td>
</tr>
<tr>
<td>10</td>
<td>Non-Ideal Operational Amplifiers</td>
</tr>
<tr>
<td>11</td>
<td>Phase Locked Loops</td>
</tr>
<tr>
<td>12</td>
<td>Charge-Pump PLL – Switched Capacitor Circuits (Sampling)</td>
</tr>
<tr>
<td>13</td>
<td>Switched Capacitor Amplifiers</td>
</tr>
<tr>
<td>14</td>
<td>MOSFET Circuits Fabrication Steps</td>
</tr>
<tr>
<td>15</td>
<td>MOSFET Circuits Design Rules</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam</td>
</tr>
</tbody>
</table>
EC 434 - Analog Signal Processing

COURSE INFORMATION

Course Title: Analog Signal Processing.
Code: EC 434.
Hours: Lecture – 2 Hr. Tutorial/Lab – 2/2 Hrs. Credit – 3.
Prerequisite: EC 432.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

Linear and nonlinear wave shaping, sinusoidal and relaxation oscillators, sweep generator, analog filters.

TEXT BOOKS:


REFERENCE BOOKS:

- Electronic Circuit Design, Savant, Roden, Carpenter.

COURSE AIM:

Analysis and design of analog signal processing circuits.

COURSE OBJECTIVES:

The student should be familiar with:

- Analysis and design of linear and non-linear wave shaping circuits.
- Design of non-sinusoidal waveform generators.
- Design of RC active filters.
## Course Outline:

<table>
<thead>
<tr>
<th>Week Number</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to signal processing, signals and signal sources, different kinds of analog signal processing. Some practical systems: Radio and Television receivers</td>
</tr>
<tr>
<td>2</td>
<td>Linear wave shaping, RC circuits, integrators, differentiators, time and frequency response</td>
</tr>
<tr>
<td>3</td>
<td>Clipping Circuits and their applications, Simple clipping circuits, Biased clipping circuits.</td>
</tr>
<tr>
<td>4</td>
<td>Diode-Capacitor circuits (Clamping Circuits), Clamping circuits and their applications, Perfect Clamping, Practical Clamping circuits</td>
</tr>
<tr>
<td>5</td>
<td>Sinusoidal oscillators, Colpitts and Hartly oscillators, phase shift oscillator</td>
</tr>
<tr>
<td>6</td>
<td>Relaxation Oscillators, Introduction and mechanical analogies, Analysis and design of astable Multivibrators.</td>
</tr>
<tr>
<td>7</td>
<td>Analysis and design of Voltage to frequency converters, Analysis and design of Monostable Multivibrators.</td>
</tr>
<tr>
<td>8</td>
<td>Analysis and design of Bistable Multivibrators, Triggering of Bistable Multivibrators, Schmitt Trigger, Op-Amp Astable and Monostable Multivibrators</td>
</tr>
<tr>
<td>9</td>
<td>The 555 timer, internal structure and Operation as Astable and Monostable Multivibrators</td>
</tr>
<tr>
<td>10</td>
<td>Sweep generator Circuits. A basic sweep circuit, Switch-controlled sweep circuits using BJT, UJT and PUT, Constant current sweep generators.</td>
</tr>
<tr>
<td>11</td>
<td>Miller integrator, Boot-strap sweep generator circuit.</td>
</tr>
<tr>
<td>12</td>
<td>Analog Filters, Historical review of filters, Ideal filter response, Transfer function of filter functions, Realization of 2nd order sections, Design steps.</td>
</tr>
<tr>
<td>13</td>
<td>Approximations to the ideal LPF response, Butterworth approximation, Chebyshev approximation, Elliptic approximation, design from the pole-zero distribution.</td>
</tr>
<tr>
<td>14</td>
<td>Design of active filters using catalogue. Switched capacitance filters.</td>
</tr>
<tr>
<td>15</td>
<td>Number 15: Revision.</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam.</td>
</tr>
</tbody>
</table>
**EC 533 - Digital Signal Processing**

**COURSE INFORMATION**

Course Title: Digital Signal Processing.

Code: EC 533.

Hours: Lecture – 2 Hr. Tutorial/Lab – 2/2 Hrs. Credit – 3.

Prerequisite: EC 434.

**GRADING**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

**COURSE DESCRIPTION:**

ADC's and DAC's, DFT, FFT and DCT, the Z-transform, discrete time transfer function, realization topologies, FIR filter design using windowing, Optimal method, frequency sampling method, least pth norm method using MATLAB. IIR filter design, stability, bilinear transform, least pth norm method using MATLAB. Applications of DSP e.g. data compression, Data acquisition systems…etc.

**TEXT BOOKS:**


**REFERENCE BOOKS:**

- Digital signal processing, E. J. Fechner, B. Jervis, Addison-Wesly, 1993
- Electronic analog to digital converters, Seitzer, Pretzl, and Hamdy, John Wiley & Sons. 1983
- Digital filters, A. Antoniou, McGraw-Hill, 1993
- Analog and Digital Signal Processing, H. Baher, John Willey & sons, 1990

**COURSE AIM:**

Introducing the different techniques for designing and implementing digital signal processing systems and their peripherals, Discrete – time transforms.

**COURSE OBJECTIVES:**

The student should be familiar with:
- ADC and DAC techniques and their circuit implementation
- The DFT, the DCT, and the FFT algorithms
- The discrete time transfer function
- Design procedures of digital filters
- Realization topologies
- Design of FIR and IIR filters
- MATLAB usage in designing digital filters
- Some practical applications of DSP

COURSE OUTLINE:

Week Number 1: Why digital signal processing? Analog-vs-Digital signal processing, Examples of practical DSP applications, Recent trends

Week Number 2: A real-time DSP system, Sampling of Band limited analog signals, Specifications of data converters, DAC’s

Week Number 3: Quantizer characteristics, Quantization techniques, Analog comparators, Circuit implementation of quantization techniques.

Week Number 4: The cascaded architecture, Single and dual slope converters

Week Number 5: Discrete-Time transforms, The discrete-time Fourier transform, The FFT algorithm, The Butterfly properties

Week Number 6: The DFT, the DCT, the DIT FFT algorithm and its inverse (IFFT).

Week Number 7: Digital filters, Basic definitions, analog vs digital filters, Design procedures.

Week Number 8: The discrete-time transfer function, Types of digital filters, Digital filters describing equations, recursive versus non-recursive filters

Week Number 9: The Z-transform. Digital filter components, Examples of digital filter circuits.

Week Number 10: Time domain analysis, Frequency domain analysis, Stability, a stability criterion.

Week Number 11: Design of digital filters, Design procedures, Realization topologies, Hardware implementation


Week Number 13: Design of IIR filters using the Bilinear z-transform, frequency warping, Design from the Pole-Zero distribution, Design from the tolerance structure, Examples

Week Number 14: Data compression, an intro, DAS’s, DSP applications

Week Number 15: Revision

Week Number 16: Final Exam
Electronics Elective Courses

EC 530 - Micro-Electro Mechanical Systems

**Course Information**

**Course Title:** Micro-Electro Mechanical Systems.

**Code:** EC 530.

**Hours:** Lecture – 2 Hr.  Tutorial– 2 Hrs.  Credit – 3.

**Prerequisite:** EC 434.

**Grading**

- Class Performance/Attendance: 10%
- Midterm # 1/Assignments – (7th Week): 30%
- Midterm # 2/Assignments – (12th Week): 20%
- Final Exam: 40%

**Course Description:**

MEMS technology, revolution and advantages of MEMS technology. Description of the MEMS applications, and its fabrication techniques. Studying the nature of piezoelectricity and piezoresistivity. Description of the microsensors, microactuators, different system issues and the scaling effect. Finally describing the Microassembly and an overview on Microrobotics.

**Text Books:**

S. Fatikov, V. Renold, "Microsystems technology and Microrobotics"

**Course Aim:**

To learn new design technologies, large-scale designs using VLSI technology and modern computer techniques used in digital circuit designs and implementation.

**Course Objectives:**

The objective of this course is to achieve an understanding of the micro-electro-mechanical-systems (MEMS).

**Course Outline:**

- **Week Number 1:** Introduction to MEMS technology
- **Week Number 2:** MEMS applications (medical, BIOMEMS, microfluidics and environmental)
- **Week Number 3:** MEMS applications (automotive, military)
Week Number 4: MEMS applications (RF & electronics applications)

Week Number 5: MEMS fabrication techniques (Silicon properties and basic layer techniques)

Week Number 6: MEMS fabrication techniques (basic layer techniques cont.)

Week Number 7: MEMS fabrication techniques (material deposition and removal methods)

Week Number 8: The nature of piezoelectricity and piezoresistivity

Week Number 9: Microactuators

Week Number 10: Microsensors

Week Number 11: System Issues: Post-Processing Steps and Techniques

Week Number 12: Scaling, Scaling Effects.

Week Number 13: Scaling of Forces.

Week Number 14: Microassembly and Microrobotics

Week Number 15: Revision

Week Number 16: Final Exam
EC 535 - Digital VLSI Design

Course Information

Course Title: Digital VLSI Design.
Code: EC 535.
Prerequisite: CC 216, EC 432.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:

Design of VLSI digital circuits, Stick diagrams, design rules, CAD system, speed and power considerations, floor planning, layout techniques

Text Books:


Reference Books:


Course Aim:

To introduce students to the basic principles of designing a digital VLSI chip and using CAD tools and to simulate the design.

Course Objectives:

The student should gain knowledge and develop skills on: Design of Digital VLSI Circuits, Stick Diagram, Design Rules, CAD Systems, Speed and Power Considerations, Floor Planning, Layout techniques.
<table>
<thead>
<tr>
<th>Week Number</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Revision (MOSFET Physics)</td>
</tr>
<tr>
<td>2</td>
<td>Mapping Boolean functions to transistor level</td>
</tr>
<tr>
<td>3</td>
<td>Euler’s Path, Stick Diagramming Rules, Color Codes, Design Rules.</td>
</tr>
<tr>
<td>4</td>
<td>The CMOS Inverter – DC Characteristics</td>
</tr>
<tr>
<td>5</td>
<td>Pass Transistor Logic, Transmission Gates</td>
</tr>
<tr>
<td>6</td>
<td>CMOS IC Fabrication Steps, and Design Rules</td>
</tr>
<tr>
<td>7</td>
<td>Delay in logic circuits, Logical Effort (1)</td>
</tr>
<tr>
<td>8</td>
<td>Logical Effort (2)</td>
</tr>
<tr>
<td>9</td>
<td>Interconnects, Crosstalk</td>
</tr>
<tr>
<td>10</td>
<td>Power Dissipation</td>
</tr>
<tr>
<td>11</td>
<td>Combinational Circuit Families (1)</td>
</tr>
<tr>
<td>12</td>
<td>Combinational Circuit Families (2)</td>
</tr>
<tr>
<td>13</td>
<td>Sequential Circuit Design (1)</td>
</tr>
<tr>
<td>14</td>
<td>Sequential Circuit Design (2)</td>
</tr>
<tr>
<td>15</td>
<td>Concepts of Pipelining, Latency, and Throughput</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam.</td>
</tr>
</tbody>
</table>
EC 536 - VLSI Fabrication and Testing of Integrated Circuits

COURSE INFORMATION

Course Title: VLSI Fabrication and Testing of Integrated Circuits
Code: EC 536.
Prerequisite: EC 535.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

Choice of technology, different fabrication processes of VLSI integrated circuits: crystal growth, thermal oxidation, chemical etching, diffusion and ion implantation, epitaxy and chemical-vapor deposition, metallization, and process integration. Testing techniques. Design for testability.

TEXTBOOK:


REFERENCE BOOKS:


COURSE AIM:

To familiarize students with the state of the art technology and processes of VLSI fabrication, and testing of VLSI integrated circuits.

COURSE OBJECTIVES:

The student should gain knowledge on the following topics: Choice of circuit technology, process circuits associated with various types of components, fabrication of VLSI, MOS technologies, crystal growth, thermal oxidation, diffusion, ion implantation, etching and cleaning techniques, modern lithographic techniques, metallization, process integration, testing techniques and design for testability.
COURSE OUTLINE:

Week Number 1: Choice of Technology and BJT, CMOS, and BiCMOS integrated circuits, silicon technology vs. GaAs.

Week Number 2: Material Properties

Week Number 3: Phase Diagrams and Solid Solubility

Week Number 4: Crystal Growth

Week Number 5: Thermal Oxidation

Week Number 6: Diffusion (1)

Week Number 7: Diffusion (2)

Week Number 8: Ion Implantation

Week Number 9: Etching and Cleaning

Week Number 10: Modern Lithographic Techniques

Week Number 11: Epitaxy and Chemical-Vapor Deposition (CVD)

Week Number 12: Metallization

Week Number 13: Process Integration (CMOS and BJT)

Week Number 14: Test Program and Test Pattern, Test Flowchart, Plan and Strategy.

Week Number 15: Fault Diagnosis and Simulation, Testing Equipment.

Week Number 16: Final Exam.
EC 537 - Biomedical Engineering

COURSE INFORMATION

Course Title:  Biomedical Engineering.
Code:  EC 537.
Prerequisite:  EC 434.

GRADING

Class Performance/Attendance:  10%
Midterm # 1/Assignments – (7th Week):  30%
Midterm # 2/Assignments – (12th Week):  20%
Final Exam  40%

COURSE DESCRIPTION:

Biomedical instrumentation, basics of biomedical engineering, biological phenomena, biopotential amplifiers, electronic pacemaker circuits.

TEXT BOOKS:


REFERENCE BOOKS:


COURSE AIM:

Introducing basic concepts in biomedical engineering and applications of electronics in patient care medical – equipment

COURSE OBJECTIVES:

Students will apply their knowledge of electronic circuits into the analysis and design of medical equipment with emphasis on electrocardiographs, electroencephalographs, and pacemakers

COURSE OUTLINE:

Week Number 1:  Introduction” Overview of course contents, Overview of text book and references, Grading Policy, Definition of medical instruments, Historical consideration”

ELECTRONICS AND COMMUNICATIONS ENGINEERING  117
Week Number 2: Biological Currents “Law of diffusion, Drift equation, Einstein relationship, Examples of two ion currents”

Week Number 3: Biological Currents “Goldmann’s equation, Nernst equation, Tissue equivalent circuit, Depolarization of living cells, Biopotentials in the heart, Electrocardiograms”

Week Number 4: Biological Currents” Electrode charge distributions, Electrode equivalent circuit, Electrode impedance measurement, Numerical example”

Week Number 5: Thermal transducer “Semiconductor Thermistor, Whetstone bridge circuits, Conductor Thermistor, Numerical examples

Week Number 6: Strain Gauges “Blood volume measurement, Strain gauge silicon wire, Numerical examples”

Week Number 7: Differential Capacitive Transducer “Tissue displacement measurement, Capacitor in bridge circuits, Numerical examples”

Week Number 8: Biopotential Amplifiers “Potential difference in ECG and EEG equipment, Transistor differential amplifiers, Operational amplifier analysis, Biopotential measurement interference, Equivalent circuits for power line interference, Common mode Rejection Ratio, Numerical examples”

Week Number 9: Common mode Voltage Reduction” Electrocardiographs, Analysis of common mode Reduction circuits, Numerical examples, ECG block diagrams.

Week Number 10: ECG Lead connection “Standard ECG lead connections, Block diagram for standard ECG, Numerical examples, Augmented ECG lead connection, Chest ECG lead connections”

Week Number 11: Electroencephalographs “Placement of electrodes on skull, EEG electrodes, EEG block diagrams, EEG voltage measurements, Operational amplifier requirements”

Week Number 12: EEG Active filters “EEG frequency bands, Active low pass filters for delta bands, Active high pass filters for beta bands, Active band pass filters for theta and alpha bands, Active notch filters for common mode reduction, Second written examination”

Week Number 13: Pacemakers “Pacemaker block diagram, Pacemaker pulse output, Computation of battery life time, Implantable pacemakers”

Week Number 14: Electronic Pacemaker circuits “Astable Multivibrators, Monostable Multivibrators, Illustrative pacemaker circuits, Numerical examples”

Week Number 15: Preview of course contents

Week Number 16: Final Exam
EC 538 - Selected Topics in Electronics

Course Title: Selected topics in electronics.

Code: EC 538.


Prerequisite: EC434.

Grading

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

Course Description:

Selection from modern topics in electronics.

Text Books:


Reference Books:

Digital Image Processing,”"Kenneth R. Castleman", Prentice Hall

Course Aim:

The course introduces the students to digital image processing techniques and their applications. Throughout the course, the student should be familiar with image edge detection, image restoration, image segmentation, and image enhancements. Also, an overview of the color image fundamentals is introduced to the students. Furthermore, the course identifies and introduces the important methods, and applications of image compression.

Course Objectives:

Digital image processing techniques and applications are introduced.

Course Outline:

Week Number 1: Introduction to Image Processing

Week Number 2: Digital Image fundamentals
Week Number 3: Digital Image fundamentals

Week Number 4: Image Transforms

Week Number 5: Image Enhancement

Week Number 6: Image Filtration

Week Number 7: Image Filtration /7th week exam

Week Number 8: Edge detection

Week Number 9: Image restoration

Week Number 10: Image segmentation

Week Number 11: Color fundamentals

Week Number 12: Color fundamentals /12th week exam

Week Number 13: Color Image Processing

Week Number 14: Morphological image processing

Week Number 15: Image compression

Week Number 16: Final Exam.
Course Title: Optoelectronics.
Code: EC 539.
Prerequisite: EC 233.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:

Text Books:

Reference Books:

Course Aim:
The student should be familiar with optoelectronic devices: theory and applications.

Course Objectives:
To be familiar with the theory and applications of optoelectronic devices.
COURSE OUTLINE:

**Week Number 1:** Principle of optical radiation, reflection, refraction and absorption, optical properties of semiconductors, radiative transition and optical absorption, injection and radiative recombination.

**Week Number 2:** LED(1): operation, parameters and characteristics, carrier injection and spontaneous emission, internal and external radiative efficiencies.

**Week Number 3:** LED(2): performance, current characteristics, response time, advanced LEDs: Heterojunction LED, edge-emitting LED, surface emitting LED.

**Week Number 4:** Stimulated versus spontaneous emission, laser operation: population inversion, carrier and optical confinement, optical feedback and laser oscillation

**Week Number 5:** Threshold current density in laser, laser below and above the threshold, gain.

**Week Number 6:** Materials and laser structures for superior performance, advanced laser diode (LD), homojunction, heterojunctions, distribution feedback (DFB) laser diode, surface emitting diode.

**Week Number 7:** Laser modulator, holographic data system.

**Week Number 8:** Photo detector: operation, limitation, cutoff wavelength for absorption, responsively, quantum efficiency, and response speed.

**Week Number 9:** Photo detector: photo current and photo current gain in photo conductor, metal-semiconductor photo diode, heterojunction photodiode, photo resistor.

**Week Number 10:** Unity gain and current amplifying photo diode.

**Week Number 11:** Solar cell: operation, performance, conversion efficiency, series resistance, recombination current.

**Week Number 12:** Advanced solar cell and encapsulation, heterojunction solar cell, Shotky barrier solar cell, metal-insulator solar cell, optical concentration.

**Week Number 13:** Fabrication of planar semiconductor devices, bulk crystal growth, epitaxy crystal growth.

**Week Number 14:** Lithography photo resist coating, mask generation and image transform, etching, wet chemical etching, epitaxy regrowth.

**Week Number 15:** Fabrication of optoelectronic devices: LD, LED, photodiode, optical fibers – Optical computer.

**Week Number 16:** Final Exam
**EC 560 - Modern Electronic Circuits**

**COURSE INFORMATION**

Course Title: Modern Electronic Circuits.

Code: EC 560.

Hours: Lecture – 2 Hr., Tutorial – 2 Hrs., Credit – 3.

Prerequisite: EC 434.

**GRADING**

<table>
<thead>
<tr>
<th>Grading Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Performance/Attendance</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm # 1/Assignments – (7th Week)</td>
<td>30%</td>
</tr>
<tr>
<td>Midterm # 2/Assignments – (12th Week)</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
</tr>
</tbody>
</table>

**COURSE DESCRIPTION:**

A course that integrates electronic courses with communication courses to give students the overall picture of different communication systems. This includes the design, analysis, testing and troubleshooting methods to be carried in these systems.

**TEXT BOOKS:**


**COURSE AIM:**

Introduce the process of designing and implementing Communication systems using electronic circuits. This includes the measurements and troubleshooting mechanisms proposed for every communication system explained in the course.

**COURSE OBJECTIVES:**

Address the need of integrating electronic and communications courses to allow students to vision how systems are implemented electronically.

**COURSE OUTLINE:**

- **Week Number 1:** Introductory Topics.
- **Week Number 2:** Amplitude Modulation: Transmission.
- **Week Number 3:** Reception. Receiver Characteristics.
- **Week Number 4:** Frequency Modulation: Transmission.
Week Number 5: Frequency Modulation: Reception.

Week Number 6: Communications Techniques.

Week Number 7: Digital Communications: Coding Techniques.

Week Number 8: Wireless Digital Communications 1.

Week Number 9: Wireless Digital Communications 2.

Week Number 10: Network Communications 1.

Week Number 11: Network Communications 2.

Week Number 12: Internet. IP Telephony. Interfacing the Networks

Week Number 13: Television 1.

Week Number 14: Television 2.

Week Number 15: Revision.

Week Number 16: Final Exam.
Electromagnetic and Antenna Courses

EC 341 – Electromagnetics

COURSE INFORMATION

Course Title: Electromagnetics.
Code: EC 341.
Prerequisite: BA 114, BA 224.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

Review of vector analysis, electromagnetic fields: Coulombs law, electric field and flux density, Gauss’s law, electric potential, conductors and semi–conductors, dielectric and capacitance, polarization, magnetic field and flux density, Biot Savart law, Ampere’s law, magnetic potential. Maxwell’s equations, and magnetization vectors, analogy between electrostatics and magnetostatic, boundary conditions.

TEXT BOOKS:


REFERENCE BOOKS:


COURSE AIM:

To introduce the students to the basics of the electromagnetic waves, and to furnish a theoretical background to subsequent courses of antennas and propagation.

COURSE OBJECTIVES:

- Concise treatment of vector analysis.
- Analysis of electrostatic field due to different forms of electric charges.
- Studying of moving charges, conductor, semiconductor and dielectric.
- Analysis of magnetostatic field due to different forms of current element.
COURSE OUTLINE:

Week Number 1: Vector analysis “Scalars and vectors, Vector algebra, The Cartesian coordinates systems, different types of vector product, Vector components and unit vectors”

Week Number 2: Coulomb’s law and electric field intensity “The experimental law of Coulomb, electric field intensity”

Week Number 3: Electric field intensity for some sources of charge “Electric field intensity of line charge, Electric field intensity of surface charge”

Week Number 4: Electric flux density, Gauss’s law and divergence “Electric flux density, Gauss’s law, Application of Gauss’s law, Divergence law, Divergence theorem”

Week Number 5: Energy and potential “Energy expended in building a system of charges, The potential field of a different types of charges, Energy density in the electrostatic field”

Week Number 6: Conductors and Semiconductors ”Current and current density, Conductor properties and Boundary conditions, Ohm’s Law, Advantages of semiconductors”

Week Number 7: 7th week exam

Week Number 8: Dielectric and capacitance” The nature of dielectric materials, Polarization, Boundary conditions for perfect dielectric materials, Capacitance”

Week Number 9: The steady magnetic field “Biot-Savart law, Ampere’s circuital law, Curl, Stocke’s theorem”

Week Number 10: Magnetic flux and magnetic field ” Determination of the steady magnetic field for different current elements, The scalar and vector magnetic potentials,”

Week Number 11: Magnetic forces “Force on a moving charge, Force on a different current element, Application on the force between different current elements”

Week Number 12: 12th week exam

Week Number 13: Magnetic materials “The nature of magnetic materials, Magnetization, Magnetic boundary conditions, Potential energy and forces on magnetic materials,”

Week Number 14: Time-varying fields” Faraday’s law, Displacement current, Maxwell’s equations, The retarded potential, The magnetic circuit, Inductance,”

Week Number 15: Revision “Overall course revision”

Week Number 16: Final Exam.
EC 442 - Electromagnetic Wave Propagation

**Course Information**

- **Course Title:** Electromagnetic Wave Propagation.
- **Code:** EC 442.
- **Hours:** Lecture – 2 Hr.  Tutorial – 2 Hrs.  Credit – 3.
- **Prerequisite:** EC 341.

**Grading**

- Class Performance/Attendance: 10%
- Midterm # 1/Assignments – (7th Week): 30%
- Midterm # 2/Assignments – (12th Week): 20%
- Final Exam: 40%

**Course Description:**

Wave equation, Uniform plan waves, Wave propagation in free space, perfect dielectric, lossy and good conductors, skin effect, surface impedance. Normal incidence, reflection coefficient and standing wave pattern. Input impedance, Oblique incidence reflection coefficients for horizontal and parallel polarization Brwester angle, and types of polarization. Fundamental parameters of antennas, Linear wire antenna (infinitesimal, small, finite length dipole, and half-wavelength dipole). Ground wave propagation. Troposphere propagation. Ionosphere wave propagation.

**Text Books:**


**Reference Books:**

- Jordan & Bulmain, "Electromagnetic Waves and Radiating Systems"

**Course Aim:**

To select and design the perfect communication link to achieve the optimum performance for transferring information.

**Course Objectives:**

- To apply wave theory to uniform plane waves in different media.
- To investigate its performance when incident on a boundary between two mediums.
- To investigate radio wave propagation channels in medium, high and very high frequencies.
To investigate different mechanisms of wave propagation.

**Course Outline:**

*Week Number 1*: Wave equation “its solution in case of Free Space & Perfect Dielectric Medium”

*Week Number 2*: Solution of wave equation in a lossy dielectric medium “Propagation Constant, Intrinsic Impedance, Electric and magnetic field, Loss Tangent, Average Power,”

*Week Number 3*: Solution of wave equation in Good Conductors “Propagation Constant., Intrinsic Impedance, Electric, Magnetic Field Equation, Skin Depth, Power Losses.”

*Week Number 4*: Normal incidence of uniform plane wave “Reflection coefficient, Transmission coefficient, Standing Wave and Standing Wave Ratio, Input impedance”

*Week Number 5*: Oblique incidence of uniform plane wave on a boundary (Γ,Brwester angle, Critical Angle).”

*Week Number 6*: “Total Internal Reflection, Surface impedance (Zs),Polarization Types”

*Week Number 7*: 7th week exam

*Week Number 8*: Fundamental parameters of Antennas (Radiation pattern, Directivity, Gain, Antenna efficiency, HPBW, Beam efficiency, Bandwidth, Polarization, Input impedance)

*Week Number 9*: Radiation integrals and auxiliary potential functions (Magnetic and electric vector potentials, Solution of the inhomogeneous vector potential wave equation)

*Week Number 10*: Linear wire antennas (infinitesimal dipole, small dipole)

*Week Number 11*: Linear wire antennas (finite length dipole, half-wavelength dipole)

*Week Number 12*: 12th Week Exam

*Week Number 13*: Radio wave propagation “Classification of radio waves, Free space and Ground Wave propagation, reflection of radio waves from the earth's surface”

*Week Number 14*: Tropospheric wave propagation “General properties of the troposphere, Effect of troposphere on ground wave, Effective earth’s radius,”

*Week Number 15*: Ionospheric wave propagation “The constitution and structure of the upper atmosphere, Physical processes in the propagation of different waves,”

*Week Number 16*: Final Exam
EC 443 - Electromagnetic Transmitting Media

Course Title: Electromagnetic Transmitting Media.
Code: EC 443.
Hours: Lecture – 2 Hr. Tutorial/Lab – 2/2 Hrs. Credit – 3.
Prerequisite: EC 442.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:

Text Books:

David M. Pozar, "Microwave Engineering", John Willey & Sons, Inc., 1998

Reference Books:

- Warren, Garry, "Antenna theory and design"

Course Aim:

To apply wave theory to waveguides as well as cavity resonators for the purpose of analysis and design. To apply wave theory on the transmission lines for the purpose of analysis & design.

Course Objectives:

- To apply wave theory to rectangular and cylindrical waveguides, to demonstrate losses in the waveguide (wall and dielectric losses). Quality factor & losses for the cavity resonator.
- To apply wave theory on the transmission lines for the purpose of analysis & design.
Course Outline:

Week Number 1: Transmission lines “Characteristics Impedance, Input Impedance, Transmission line equations, Termination of a transmission line (Short & open circuits)”

Week Number 2: Graphical method (Smith Chart).” “Analysis of a Smith Chart”

Week Number 3: Applications of Smith Charts “Solving of the transmission lines problems, Reflection Coefficient, Input Impedance of transmission line, and Standing Wave Ratio”

Week Number 4: Single stub matching “Determination of the parameters of the series or the parallel single Stub connected with T.L”

Week Number 5: Double stub matching “Determination of the parameters of the series or the parallel double Stub connected with T.L”

Week Number 6: Triple stub matching “Determination of the parameters of the Triple Stub, (λ/4)transformers, Baluns delay lines, and pulse forming transmission lines”

Week Number 7: 7th week exam

Week Number 8: Wave equation in rectangular W.G “introduction to wave guides and cut-off frequency, Wave equation, Polarization for TE and TM, Solution of wave equation”

Week Number 9: Solution of wave eqn. “Introduction to TM waves, Boundary Conditions of TM mode, Field components in TM mode & cutoff frequency

Week Number 10: TE mode & its boundary conditions “Introduction to TE mode, Field components”

Week Number 11: Power transmitted & dielectric losses “Average power transmitted and total power transmitted for TE & TM Mode, Dielectric losses in rectangular W.G”

Week Number 12: 12th week exam

Week Number 13: Wall losses in rectangular W.G “Wall losses for TM mode, Wall losses for TE mode, Wall losses for dominant mode”

Week Number 14: Circular Wave guide.” Wave equation in circular coordinates, Solution of wave equation, Power transmitted in circular W.G., Wall losses in circular W.G”

Week Number 15: Rectangular and Circular cavity resonator “Introduction to cavity resonator, Quality factor, losses”

Week Number 16: Final Exam.
EC 544 - Antenna Engineering

COURSE INFORMATION

Course Title: Antenna Engineering.
Code: EC 544.
Hours: Lecture – 2 Hr. Tutorial/Lab – 2/2 Hrs. Credit – 3.
Prerequisite: EC 443.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:


TEXT BOOKS:

Balanis, Antenna theory analysis and design, 1997 by John Wiely & Sons, Inc.

REFERENCE BOOKS:


COURSE AIM:

To investigate the performance of commonly used types of antennas through mathematical manipulation and practical experiments.

COURSE OBJECTIVES:

- To Introduce the various antenna types.
- To Briefly discuss some forms of the various antenna types.
- To Introduce the radiation characteristic requirements for many applications.
- To Discuss the performance of some antenna types experimentally.
COURSE OUTLINE:

**Week Number 1:** Linear arrays “Two-element array. N-element Uniform linear arrays (broadside Linear, and Endfire linear arrays)

**Week Number 2:** “N-element Uniform linear arrays (electronic scanning linear arrays). Non uniform linear arrays, Array factor of even or odd number of elements,”

**Week Number 3:** Non uniform linear arrays “Design procedure, Directivity and beam width, Graphical representation of array factor of binomial array”

**Week Number 4:** Non uniform linear arrays “Dolph-Tschebyscheff arrays, Design procedure, Directivity and beam width, Graphical representation of the array factor,”

**Week Number 5:** Planar arrays and circular arrays “Properties of planar array, Array factor of planar array, Directivity and beam width, Array factor of circular array,”

**Week Number 6:** Radiation from aperture on conducting and on free space “Hugen’s principles, Magnetic current, Equivalence principle, Auxiliary potential functions, procedures of calculating the far fields”

**Week Number 7:** 7th Week Exam

**Week Number 8:** Radiation from a uniform illuminated rectangular and circular aperture “Far fields, Beam width and directivity for E- and H- plane pattern,”

**Week Number 9:** Horn Antennas “Types of horn antennas, Design of E-plane sectoral horn, Directivity”

**Week Number 10:** Horn Antennas “Design of H-plane sectoral horns, Directivity, Design of pyramidal horn, Directivity”

**Week Number 11:** Parabolic reflector (Introduction, Geometry of reflector, Effect the type of feeder)

**Week Number 12:** 12th Week Exam

**Week Number 13:** Parabolic reflector (Analysis, Radiated field, Directivity)

**Week Number 14:** Loop antennas (Introduction, Calculation the far field, Radiation resistance, Directivity)

**Week Number 15:** Traveling wave antennas and rhombic antenna “Construction, Calculation the far field, The locations of nulls, The locations of peaks, Advantages, Rhombic antenna”

**Week Number 16:** Final Exam.
EC 546 - Microwave Technology

COURSE INFORMATION

Course Title: Microwave Technology.

Code: EC 546.


Prerequisite: EC443, EC434.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

Comprehensive knowledge of microwave hardware. This includes passive and active components. The study extends to the design and analysis of all generating and amplifying devices. Also exploring the different measuring techniques used at such frequency range as well as the related measuring techniques.

TEXT BOOKS:

Microwave device Circuits, Samuel Liao, Prentice Hall

COURSE AIM:

This course is designed to provide the student with comprehensive knowledge of microwave hardware. This includes passive and active components. The study extends to the design and analysis of all generating and amplifying devices. The course aims also at exploring the different measuring techniques used at such frequency range as well as the related measuring techniques.

COURSE OBJECTIVES:

To provide the student with detailed analysis of the theory and design equation of all microwave active and passive components. The study comprises tube-type and semiconductor device covering a wide range of a power and frequencies.

COURSE OUTLINE:

Week Number 1: Introduction: The Microwave Band, why microwaves and their applications

Week Number 2: Motion of charged particles in E and M fields
Week Number 3: Microwave components: coaxial cable, wave guides, cavity resonators, wave guide accessories. Magic T isolators, circulators, T-R switches, Duplexers directional couplers.

Week Number 4: HF limitations of conventional vacuum tubes, and transistors. Microwave Bipolar transistors. HBT, HEMT, MESFET, MOSFET

Week Number 5: Microwave devices: Varactors, tunnel diodes, and Gunn diodes. Theory and characteristics.

Week Number 6: Avalanche breakdown diodes, TRAPATT and IMPAAT

Week Number 7: Microwave amplifiers: Klystron amplifier theory and analysis

Week Number 8: Microwave amplifiers cont.: TWT amplifier, crossed field amplifier, parametric amplifier

Week Number 9: Microwave Oscillators, magnetron oscillator.

Week Number 10: Microwave Oscillators Cont., Reflex klystron, Backward wave oscillator, Gunn-diode oscillator.

Week Number 11: Microwave mixers: crystal mixers, magic T, klystron mixer, Rate Race mixer.

Week Number 12: Microwave integrated circuits techniques, micro-strip lines, microwave monolithic IC (MMIC) thin films, Hybrid IC

Week Number 13: Microwave measurements techniques, Introduction, overview.

Week Number 14: Slotted coaxial lines, measurements of VSWR, power measurements

Week Number 15: Measurements of antennas parameters and patterns

Week Number 16: Final Exam.
EC 545 Advanced Antennas Systems*

COURSE INFORMATION

Course Title: Advanced Antennas Systems.
Code: EC 545.
Hours: Lecture – 2 Hr. Tutorial/Lab – 1/1 Hrs. Credit – 3.
Prerequisite: EC 443.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

Rectangular Microstrip antenna (definition, analysis, design, radiation pattern, directivity). Circular Microstrip antenna (definition, analysis, design, radiation pattern, directivity). Wideband Antenna (analysis of Spiral Antenna, Conical Antenna, Cylindrical Antenna). Helical Antenna (analysis, design, radiation pattern, directivity). Inverted F Antenna (analysis, design, radiation pattern, directivity). Log Periodic Antenna (analysis, design, radiation pattern, directivity). Analysis of Lens Antenna. Introduction to Smart Antenna.

TEXT BOOKS:


REFERENCE BOOKS:


COURSE AIM:

To introduce students to the different antennas that used for mobile communication (for both the base station and for hand set), their parameters, and the procedures of design

COURSE OBJECTIVES:

To introduce students to the different antennas that used for mobile communication (for both the base station and for hand set), their parameters, and the procedures of design. These antennas are:

- Microstrip antennas (Rectangular and Circular Patch)
- Wideband Antennas (Spiral Antenna, Conical Antenna, Cylindrical Antenna).
- Helical Antenna
Inverted F Antenna.
Log Periodic Antenna
Lens Antenna
Smart Antenna

**COURSE OUTLINE:**

<table>
<thead>
<tr>
<th>Week Number</th>
<th>Course Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fundamental Parameters of Antennas (Radiation pattern, Directivity, Gain, Bandwidth, Beamwidth, Efficiency, and Input impedance).</td>
</tr>
<tr>
<td>2</td>
<td>Introduction to Microstrip Antennas (Definition, Advantages, Disadvantage, Applications)</td>
</tr>
<tr>
<td>3</td>
<td>Rectangular Microstrip Antennas (Analysis of a Rectangular Patch – transmission line Method - Radiation pattern, Directivity, Radiation resistance)</td>
</tr>
<tr>
<td>4</td>
<td>Design procedures for rectangular microstrip antenna, Compact Rectangular Microstrip Antennas (Quarter – Wave Rectangular Patch)</td>
</tr>
<tr>
<td>5</td>
<td>Analysis of Circular Microstrip Antennas (Using Cavity model- Radiation pattern, Directivity, Radiation resistance)</td>
</tr>
<tr>
<td>6</td>
<td>Design procedures for circular microstrip antenna, Small circular Microstrip Antennas</td>
</tr>
<tr>
<td>7</td>
<td>7th week exam</td>
</tr>
<tr>
<td>8</td>
<td>Wideband Antenna (Spiral, Conical, and Cylindrical Antennas)</td>
</tr>
<tr>
<td>9</td>
<td>Wideband Antenna (Spiral, Conical, and Cylindrical Antennas)</td>
</tr>
<tr>
<td>10</td>
<td>Helical (Normal And Axial Mode), Inverted F Antennas, and Planar F antenna</td>
</tr>
<tr>
<td>11</td>
<td>Helical (Normal And Axial Mode), Inverted F Antennas, and Planar F antenna</td>
</tr>
<tr>
<td>12</td>
<td>12th Week Exam</td>
</tr>
<tr>
<td>13</td>
<td>Log Periodic, and Lens Antennas (analysis and design)</td>
</tr>
<tr>
<td>14</td>
<td>Log Periodic, and Lens Antennas (analysis and design)</td>
</tr>
<tr>
<td>15</td>
<td>Introduction to Smart Antennas</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam.</td>
</tr>
</tbody>
</table>
Courses for Other Departments

Solid State Electronics and Measurements Courses

EC 211 Solid State Electronics

COURSE INFORMATION

Course Title: Solid State Electronics.

Code: EC 211.

Hours: Lecture – 2 Hr. Tutorial/Lab – 2/1 Hrs. Credit – 3.

Prerequisite: BA114, BA118.

GRADING

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

COURSE DESCRIPTION:

Elementary materials science concepts: Atomic structure, Bonding and types of solids, The crystalline state. Lattice vibrations. The hall effect and hall devices. Quantum mechanics: photons, particles and waves, the electron as a wave, infinite potential well, Heisenberg’s uncertainty principle, Tunneling phenomenon (potential barrier). The band theory of solids: E-K diagram, energy bands diagram, Electrons and holes, effective mass Semiconductors: Intrinsic semiconductors, Extrinsic semiconductors( n-type doping, p-type doping, compensation doping), Electron and holes Concentrations, Fermi energy level position, Conductivity of a semiconductor, Diffusion and conduction currents equations. Definitions for dielectric and magnetic materials and superconductivity.

TEXT BOOKS:


REFERENCE BOOKS:

C.Kittel, Introduction To Solid State Physics, John Wiley and Sons

COURSE AIM:

To present the basic physical concepts about the operational principles of crystalline solids.
COURSE OBJECTIVES:

With the knowledge of the fundamental principles learned in this course, the student will be able to follow the theoretical details of the advanced-level courses.

COURSE OUTLINE:

Week Number 1: General introduction for the course contents and the grading system.

Week Number 2: Atomic structure, Molecules and general bonding principles.

Week Number 3: Types of crystals.

Week Number 4: Covalent Bond, Metallic Bond, Ionic Bond

Week Number 5: Miller indices: crystal directions and planes.

Week Number 6: The dispersion relationship of a mono atomic lattice vibrations, phase and group velocities.

Week Number 7: Particles and waves

Week Number 8: De Broglie relationship, time independent Schrödinger equation, Heisenberg’s uncertainty principle.

Week Number 9: Application on Schrödinger equation (Infinite potential well: A confined electron)

Week Number 10: Application on Schrödinger equation (Tunneling phenomenon: Quantum leak)

Week Number 11: Energy Band theory of solids: (energy bands, effective mass, concept of a hole)

Week Number 12: (Semiconductors) Intrinsic semiconductors (Si crystal and energy band diagram, electrons and holes, conduction in semiconductors, electrons and holes concentrations).

Week Number 13: (Semiconductors ) Extrinsic semiconductor: (n-type doping, p-type doping, compensation doping) and carriers concentrations. Fermi energy level position.

Week Number 14: Semiconductor conductivity and resistivity.

Week Number 15: Semiconductors (Diffusion and conduction current equations).

Week Number 16: Final Exam.
EC 218 Measurements & Instrumentation  
COURSE INFORMATION

Course Title: Measurements & Instrumentation.
Code: EC 218.
Hours: Lecture – 2 Hr.  Tutorial/Lab – 2/2 Hrs.  Credit – 3.
Prerequisite: EE 231.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

Measurements of errors, Accuracy, Precision, Resolution, Sensitivity. Statistical analysis (Mean, Deviation, Standard Deviation, and Variance). Units and standards of measurement. Electromechanical indicating instruments. Analog Instruments (DC Ammeter (Ayrton Shunt), DC Voltmeter, Ohmmeter (Series type, Shunt Type), AC Instruments with Rectifiers (full wave and half wave rectifiers), Bridge measurements (AC Bridges(Maxwell bridge, wien bridge, Schering bridge), DC Bridges(Wheatstone bridge)), Digital instruments for measuring basic parameters, True RMS voltmeters, Q-meter, Oscilloscope techniques.

TEXT BOOKS:

“Modern electronic instrumentation and measurements techniques” Albert Helfrick and William Cooper

REFERENCE BOOKS:

- Larry Jones and A. Foster Chin ,“Electronic measurements and instruments”
- J.B.GUPTA, “Electronic and Electrical Measurements and Instrumentation“

COURSE AIM:

An Introduction to the basic concepts and techniques of measuring physical electrical and electronic quantities. To train students for the effective usage of the basic Lab instruments
COURSE OBJECTIVES:

Understanding the basic measurement techniques such as accuracy, precision, standards. To study the operation and construction of analog, electronic and digital multi-meters.

COURSE OUTLINE:

Week Number 1: Definitions, The importance of electronic measurements for engineers, Types of errors

Week Number 2: Statistical analysis

Week Number 3: Review on the fundamental and derived units, Classification of standards, Electrical standards, IEEE standards

Week Number 4: Permanent magnet moving coil

Week Number 5: DC voltmeters, sensitivity, Use the sensitivity method for the design of DC voltmeter, Analyze a circuit taken into consideration in loading effect

Week Number 6: Series type and shunt type ohmmeters, Calibration of DC instruments

Week Number 7: 7th week exam

Week Number 8: Alternating current indicating instruments, AC voltmeters with full wave rectifiers and half Wave rectifiers.

Week Number 9: DC bridges and sources of error, AC bridges

Week Number 10: AC voltmeters using rectifiers

Week Number 11: True RMS – Responding Voltmeter

Week Number 12: Component measuring instruments, Basic Q-meter circuits: a- Direct connection b- Series connection c- Parallel connection Sources of error”

Week Number 13: Oscilloscope measurements (phase shift, period and voltages)

Week Number 14: Oscilloscope block diagram

Week Number 15: Oscilloscope techniques, Special oscilloscopes, (a) storage oscilloscope, (b) sampling oscilloscope (c) Digital storage oscilloscope”

Week Number 16: Final Exam.
## EC 416 Electronic Measurements

### Course Information

<table>
<thead>
<tr>
<th>Course Title:</th>
<th>Electronic Measurements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code:</td>
<td>EC 416</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>EC 331</td>
</tr>
</tbody>
</table>

### Grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Performance/Attendance</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm # 1/Assignments – (7th Week):</td>
<td>30%</td>
</tr>
<tr>
<td>Midterm # 2/Assignments – (12th Week):</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
</tr>
</tbody>
</table>

### Course Description:

Some important terminologies such as (precision, resolution, sensitivity, accuracy). Types of errors and calibration techniques. Statistical analysis, Standard units of measurements. AC and DC bridges are presented. Transducers requirements, classification of transducers, Selecting of Transducer, Strain gauge transducer, Displacement Transducer, Capacitive Transducer, Inductive Transducers, Piezoelectric Transducer, Temperature Transducers, Photoelectric Transducers. Signal conditioning circuit. Digital to analog and analog to digital converters. Data acquisition system and computerized control.

### Text Books:

Cooper, Electronic instrumentation and measurement techniques, 1990 by Prentice-Hall, Inc.

### Reference Books:

Berlin, Experiment in electronic devices, 1984 by Bell & Howell company

### Course Aim:

Understanding the basic concepts of electronic measurements quantities. Transducers, Automated measurement and control techniques.

### Course Objectives:

Understanding the basic measuring techniques of quantities. Getting acquainted with the techniques of waveform generation, Transducers and automated measurements.
COURSE OUTLINE:

**Week Number 1:** Definitions - Accuracy and precision

**Week Number 2:** Types of errors, calibration techniques

**Week Number 3:** Statistical analysis

**Week Number 4:** DC bridges

**Week Number 5:** AC bridges.

**Week Number 6:** Introduction on Transducers and Resistive position transducers.

**Week Number 7:** Strain Gauge Transducers

**Week Number 8:** Temperature sensors, temperature measurements devices, Thermistors.

**Week Number 9:** Photoelectric transducers

**Week Number 10:** Inductive transducers

**Week Number 11:** Capacitive transducers

**Week Number 12:** Data acquisition systems (ADC Converters)

**Week Number 13:** DAC Converters

**Week Number 14:** Introduction to computer controlled measurements

**Week Number 15:** Revision

**Week Number 16:** Final Exam
Communication Courses

EC 320 Communication Theory

Course Title: Communication Theory.

Code: EC 320.


Prerequisite: BA 224, EE 231.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

Course Description:

Introduction to communication theory. Review of Fourier series, and Fourier transform as a mathematical tool for spectral analysis. Concept of power and energy spectral densities and correlation between waveforms. Transmission through linear filters and channels. Hilbert transform and Amplitude Modulation techniques.

Text Books:


Reference Books:

Alan V. Oppenheim “Signals and systems” Prentice Hall

Course AIM:

The course introduces the concept of line spectrum as well as the continuous spectrum using FT to introduce the mathematical background and a brief introduction to communication systems to be continued in the following communication course as follows:

Course Objectives:

- Classification of signals and their spectrum.
- Fourier Transform and its properties in time and frequency domains.
- Linear Systems.
- Introduction to communication systems and Amplitude Modulation and Demodulation.
## Course Outline:

<table>
<thead>
<tr>
<th>Week Number</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Classification of Signals - sum of periodic signals</td>
</tr>
<tr>
<td>2</td>
<td>Orthogonality - Fourier Analysis of Periodic Signals</td>
</tr>
<tr>
<td>3</td>
<td>Fourier Transform and Properties of F.T.</td>
</tr>
<tr>
<td>4</td>
<td>Properties of F.T. (cont.)</td>
</tr>
<tr>
<td>5</td>
<td>F.T. of Special Functions</td>
</tr>
<tr>
<td>6</td>
<td>Fourier Transform of periodic signals - Digital &amp; analog signals</td>
</tr>
<tr>
<td>7</td>
<td>Discrete Fourier transform - Sampling Theory</td>
</tr>
<tr>
<td>8</td>
<td>Auto-correlation &amp; cross-correlation of power and energy signals - Spectral densities of power and energy signals</td>
</tr>
<tr>
<td>9</td>
<td>Hilbert transform</td>
</tr>
<tr>
<td>10</td>
<td>Response of low-pass and band-pass filters</td>
</tr>
<tr>
<td>11</td>
<td>Double side band transmitted carrier amplitude modulation and demodulation</td>
</tr>
<tr>
<td>12</td>
<td>DSB Surprised carrier amplitude modulation and demodulation</td>
</tr>
<tr>
<td>13</td>
<td>Single side band amplitude modulation</td>
</tr>
<tr>
<td>14</td>
<td>Single side band amplitude demodulation</td>
</tr>
<tr>
<td>15</td>
<td>Vestigial side band amplitude modulation and demodulation</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam</td>
</tr>
</tbody>
</table>
EC 323 - Introduction to Communication Systems

COURSE INFORMATION

Course Title: Introduction to Communication Systems.

Code: EC 323.


Prerequisite: EC 320.

GRADING

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

COURSE DESCRIPTION:


TEXT BOOKS:

P. Lathi, “Modern Digital and Analog Communication Systems”

COURSE AIM:

To get the student familiar with analog modulation techniques and their applications. Study of pulse modulation systems and base band digital communication systems, channel capacity, channel coding.

COURSE OBJECTIVES:

- Fundamentals of Analog and Digital modulation
- Convolutional coding
- Viterbi decoding
- Multiplexing techniques

COURSE OUTLINE:

Week Number 1: Analog Communication systems and continuous wave modulation( AM, FM, PM)

Week Number 2: Anagram Communication systems and continuous wave modulation( AM, FM, PM)
<table>
<thead>
<tr>
<th>Week Number</th>
<th>Course Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Applications of Amplitude modulation (DSBSC, DSBTC, SSBSC)</td>
</tr>
<tr>
<td>3</td>
<td>Angle Modulation (FM, PM)</td>
</tr>
<tr>
<td>4</td>
<td>NBFM</td>
</tr>
<tr>
<td>5</td>
<td>WBFM</td>
</tr>
<tr>
<td>6</td>
<td>Digital communication systems and Sampling Theory</td>
</tr>
<tr>
<td>7</td>
<td>Analog Pulse Modulation</td>
</tr>
<tr>
<td>8</td>
<td>Week Number 8: TDM Systems</td>
</tr>
<tr>
<td>9</td>
<td>PCM Systems</td>
</tr>
<tr>
<td>10</td>
<td>Digital Modulation (ASK, FSK)</td>
</tr>
<tr>
<td>11</td>
<td>Digital Modulation (PSK)</td>
</tr>
<tr>
<td>12</td>
<td>Channel Capacity and BEC</td>
</tr>
<tr>
<td>13</td>
<td>Linear Block Coding</td>
</tr>
<tr>
<td>14</td>
<td>Convolutional Coding</td>
</tr>
<tr>
<td>15</td>
<td>Viterbi Decoding</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam</td>
</tr>
</tbody>
</table>
EC 134 - Fundamentals of Electricity and Electronics

**Course Information**

- **Course Title:** Fundamentals of Electricity and Electronics
- **Code:** EC 134
- **Hours:** Lecture – 2 Hr. Tutorial/Lab – 2/2 Hrs. Credit – 3
- **Prerequisite:** BA 113

**Grading**

- Class Performance/Attendance: 10%
- Midterm # 1/Assignments – (7th Week): 30%
- Midterm # 2/Assignments – (12th Week): 20%
- Final Exam: 40%

**Course Description:**

This course provides an introduction to the basic concepts of electricity and electronics concepts. This is useful in understanding the operations of robotics. The topics of interest include the basics of electricity and electrical circuit's components. It covers also the basic DC and AC circuits' analysis, power and resonance, and transformers. The electronic topics include semiconductors, diodes and transistors. The course covers practical and applications of the studied topics in the operations of amplifiers and oscillators.

**Text Books:**

Floyd, “Electronics Fundamentals, Circuits, Devices and Applications"

**Reference Books:**

- Stan Gibilisco, Teach Yourself Electricity and Electronics, McGraw Hill.
- Forrest M. Mims; Getting Started in Electronics; Master Publishing, INC, 2003.

**Course Aim:**

Introducing different electronic devices used in constructing modern electronic circuits: diodes – bipolar junction transistor, field effect transistor and operational amplifiers. Studying the performance with special emphasis on some practical applications.
COURSE OBJECTIVES:

Upon completion of this course, students should be able to:

- Understand the basic principles of electricity and electronics.
- Identify the electrical and electronic components and circuits.
- Understand the operation and uses of amplifiers and oscillators.
- Carry out simple electronic projects.

COURSE OUTLINE:

Week Number 1:  Basic Physical Concepts
Week Number 2:  Electrical Units & Measuring Devices.
Week Number 3:  Basic dc circuits.
Week Number 4:  Direct –Current Circuit Analysis
Week Number 5:  Alternating Current Basics.
Week Number 6:  RLC Circuit Analysis –Power & Resonance in AC Circuits.
Week Number 7:  Transformers and Impedance Matching.
Week Number 8:  Introduction to Semiconductors.
Week Number 9:  Some Uses Of Diodes – Part 1
Week Number 10: Some Uses Of Diodes – Part 2.
Week Number 11: Bipolar Junction Transistor (BJT) – Part 1.
Week Number 12: Bipolar Junction Transistor (BJT) – Part 2.
Week Number 13: Field Effect Transistor (FET)
Week Number 14: Amplifiers
Week Number 15: Oscillators.
Week Number 16: Final Exam.
EC 238 - Electronics (1)

COURSE INFORMATION

Course Title: Electronics (1).
Code: EC 238.
Prerequisite: EE 231.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

Semiconductors - p-n junction - diode current components - junction capacitance - junction diode as a circuit element - special p-n junctions - bipolar junction transistor and field effect transistor: structure, operation – I-V characteristics - large and small analysis.

TEXT BOOKS:


REFERENCE BOOKS:


COURSE AIM:

Introducing different electronic devices used in constructing modern electronic circuits: diodes – bipolar junction transistor and field effect transistor. Studying their performance with special emphasis on some practical applications.

COURSE OBJECTIVES:

Studying semiconductor materials, p-n junction diodes, diode as a circuit element, special diodes, Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET).

COURSE OUTLINE:

Week Number 1: Types of solids: conductor, insulator, semiconductor.
Week Number 2: Conduction and valence bands, energy gap, covalent bond – Semiconductor types – Doping of semiconductors.

Week Number 3: Mobility and conductivity in semiconductors (intrinsic and extrinsic) – Hole and electron concentration - Drift current.

Week Number 4: Diffusion and drift currents – Built-in voltage in a p-n junction – Depletion layer in a p-n junction.

Week Number 5: p-n junction diode - Forward and reverse bias - Diode as a circuit element.

Week Number 6: Half wave and full wave rectifier - Smoothing circuits - Clipping circuits - Clamping circuits.

Week Number 7: Special diodes: Zener diodes - Light emitting diodes (LEDs) – Photodiodes - Varactor diodes - Solar cells.


Week Number 9: BJT: dc solution and biasing circuits - bias stability.


Week Number 14: I-V Characteristics of MOSFET, Enhancement and depletion modes, E-MOSFET: construction, operation and I-V characteristics - ac solution of all FET types.

Week Number 15: Complementary MOSFET (CMOS): symbol - operation - Logic gates using CMOS.

Week Number 16: Final Exam.
EC 331 - Electronics

COURSE INFORMATION:

Course Title: Electronics
Code: EC 331
Prerequisites: EE231

GRADING:

Class Performance / Attendance 10%
Midterm # 1/ Assignments : ( 7th week ) 30%
Midterm # 2/ Assignments : ( 12th week ) 20%
Final Exam 40%

COURSE DESCRIPTION:

P-N junction diode, Special P-N junctions, bipolar junction and field effect transistors, Transistor amplifiers. Cascaded amplifiers, Voltage and power amplifiers. Silicon controlled rectifiers.

TEXT BOOKS:

Boylested, Nashelsky, Electronic Devices & circuit theory

REFERENCE BOOKS:

- A. Sedra & Smith, "Microelectronics Circuits" Oxford

COURSE AIM:

Introducing different electronic devices used in constructing modern electronic circuits, analysis, and study of their performance with special emphasis of some practical applications

COURSE OBJECTIVES:

Studying semiconductors materials, P-N junction diodes, diode as a circuit element, special diodes, Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET). Electronic amplifiers and switches.

COURSE OUTLINE:

Week Number 1: Semiconductor materials
Week Number 2: Extrinsic Semiconductors
Week Number 3: PN junctions
Week Number 4: Special PN junction and its applications
Week Number 5: Photo diodes, solar cells, LED's, Zener diodes
Week Number 6: Bipolar Transistors
Week Number 7: Field Effect Transistors
Week Number 8: Transistor amplifiers
Week Number 9: Cascaded amplifiers, Feedback amplifiers
Week Number 10: Power amplifiers
Week Number 11: Silicon Controlled Rectifiers & applications
Week Number 12: Power supplies
Week Number 13: Oscillators
Week Number 14: Electronic filters
Week Number 15: Revision
Week Number 16: Final Exam.
EC 339 Electronics (2)

COURSE INFORMATION

Course Title: Electronics (2)
Code: EC 339.
Hours: Lecture – 2 Hr. Tutorial/Lab – 2/2 Hrs. Credit – 3.
Prerequisite: EC 238.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam 40%

COURSE DESCRIPTION:

Electronic amplifier theory, power amplifiers, Differential amplifiers, Operational amplifiers filters and Oscillators.

TEXT BOOKS:

- C.J.Savant, M.S.Rooden, G.L.Carpenter, "Electronic Design", Addison Wesley
- Martin Rodan and Gordon Carpenter, "Electronic Design: from concept to reality"

REFERENCE BOOKS:

- Boylestad, Nashelsky, Electronic Devices & circuit theory, Prentice Hall, 2005

COURSE AIM:

The student should be able to analyze and design BJT and FET amplifiers, Power amplifiers, operational amplifiers, filters and oscillators.

COURSE OBJECTIVES:

Familiarize students with:

- Analysis and design of BJT
- Analysis of FET amplifiers
- Frequency response of BJT and FET.
- Power Amplifiers
- Analysis and design of integrated circuits
 Filters and Oscillators

**COURSE OUTLINE:**

*Week Number 1:* Revision, Transistor theory, Amplifier circuits, course overview

*Week Number 2:* Mid frequency-band equivalent circuit of transistor amplifiers. Voltage gain, current gain, input and output impedance.

*Week Number 3:* Low and High frequency response of transistor amplifiers. Design of transistor amplifiers.

*Week Number 4:* Multistage amplifiers, overall gain, frequency response, gain-bandwidth product.

*Week Number 5:* Field Effect transistor amplifiers, DC and mid-band frequency solution.

*Week Number 6:* Power amplifiers, classes of operation. Efficiency, push-pull power amplifiers.

*Week Number 7:* Feedback amplifiers.

*Week Number 8:* Sinusoidal oscillators.

*Week Number 9:* Square wave oscillators.

*Week Number 10:* Operational amplifiers, specifications. Analysis of basic Op-Amp circuits (Inverting and non-Inverting amplifiers), applications.

*Week Number 11:* Op-Amp applications.

*Week Number 12:* RC active filters.

*Week Number 13:* Power supplies, switching mode power supply.

*Week Number 14:* Introduction to IC fabrication.

*Week Number 15:* Revision

*Week Number 16:* Final exam.
EC 534 - Analog and Digital Signal Processing

COURSE INFORMATION:

Course Title: Analog and Digital Signal Processing
Code: EC 534
Hours: Lecture: 2 Hrs Tutorial: 2 Hrs Credit: 3
Prerequisites: EC 331.

GRADING:

Class Performance / Attendance 10%
Midterm # 1/ Assignments : (7th week) 30%
Midterm # 2/ Assignments : (12th week) 20%
Final Exam 40%

COURSE DESCRIPTION:

Simple analog wave shaping circuits, Sinusoidal and square wave generators. Design of RC active filters, ADC's and DAC's. Discrete transforms. Digital filter design.

TEXT BOOKS:

- Savant, Roden, and Carpenter. "Electronic Design" Benjamin cummings publ.
- Ifeachor & Gervis. "Digital Signal Processing".

REFERENCE BOOKS:

H. Baher. "Analog and Digital Signal Processing"

COURSE AIM:

Understanding the basic concepts of analog signal generation and shaping. Data converters, discrete time transforms. Digital filter design.

COURSE OBJECTIVES:

Getting familiar with basic operations on analog and digital signals.

COURSE OUTLINE:

Week Number 1: Sinusoidal oscillators
Week Number 2: Multivibrators
Week Number 3: Clipping And clamping circuits
Week Number 4: Problems on Clipping and clamping circuits
Week Number 5: Differentiating and integrating circuits
Week Number 6: Design of analog filters
Week Number 7: Sampling of analog signals, S/H circuits
Week Number 8: DAC’s
Week Number 9: Quantization techniques
Week Number 10: Analog to digital converters
Week Number 11: ADC’s cont.
Week Number 12: Introduction to discrete time transform. The DFT and DCT, the FFT
Week Number 13: The Z transform, Time and frequency analysis of digital filters
Week Number 14: Design of IIR filters using BZT
Week Number 15: Design of FIR filters using windowing
Week Number 16: Revision
Courses from Other Departments

Basic and Applied Science Courses – BA

BA 113 – Physics (1)

COURSE INFORMATION

Course Title: Physics (1).
Code: BA113.
Hours: Lecture – 2 Hrs. Tutorial-2 Hrs. Laboratory – 1 Hr. Credit – 3.
Prerequisite: None.

GRADING

Class. Experimental physics 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

COURSE DESCRIPTION

This course consists of four parts static electricity, electric current, magnetism and light.

TEXT BOOKS


REFERENCE BOOKS

References available in AAST Library.

- Raymond A. Serway and John W. Jewett, Physics for scientists and engineers, Brooks Cole; latest edition.
- Michael Nelkon and Philip Parker, Advanced level physics , Heinemann International Literature & Textbooks, latest edition.

COURSE AIM

The aim of this course is to Supply the students with strong back ground in the field of electricity and magnetism which is really needed for the to complete their study in the field of engineering and technology.
COURSE OBJECTIVES

This course provides the students with good knowledge about the nature and the existence of static electricity, the interaction between different type of charges and the electric field types generated by these charges. The course also, allows the student to distinguish between the static electricity and the electric current through the application of ohm’s law and gives the student basic information about the structure of simple electric circuit. This course gives a good background about the theory of magnetism and electromagnetic Induction.

COURSE OUTLINE

Week Number 1: Introduction to static electricity and Coulomb’s law (1).
Week Number 2: Introduction to static electricity and Coulomb’s law (2).
Week Number 3: Electric field.
Week Number 4: Electric potential.
Week Number 5: Capacitors(1)
Week Number 6: Capacitors(2)
Week Number 7: Exam # 1.
Week Number 8: Electric current, ohm’s law resistors in series and parallel (1).
Week Number 9: Electric current, ohm’s law resistors in series and parallel (2).
Week Number 10: Kirchhoff’s rule.
Week Number 11: Introduction to theory of magnetism and different applications.
Week Number 12: Exam # 2.
Week Number 13: Electromagnetic induction.
Week Number 14: Optics and waves (nature of light, properties of light waves).
Week Number 15: Young’s double slit ‘polarization of light waves.
Week Number 16: Final Exam.
BA 114 – Physics (2)

**COURSE INFORMATION**

Course Title: Physics (2).

Code: BA114.

Hours: Lecture – 2 Hrs. Tutorial-2 Hrs. Laboratory – 1 Hr. Credit – 3.

Prerequisite: BA113 - Physics (1)

**GRADING**

Class Performance/Attendance: 10%

Midterm1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

**COURSE DESCRIPTION**

This course is concerned with the investigation of the behavior of the fluid under different conditions to calculate the net work done on or by the system. It is also concerned with standing the first and second law of thermodynamics. Heat, work and internal energy of the fluids (liquid and gas) should be calculated for different processes under different condition. Heat transfer is also studied through this course.

**TEXT BOOKS**


**REFERENCE BOOKS**

References available in AAST Library.

**COURSE AIM**

The aim of this course is to develop the skills of students to solve the problems of Heat and thermodynamics and understanding the different cases and condition under which thermodynamic system operates.

**COURSE OBJECTIVES**

The objectives of this course are: Understanding the relation between heat, work and the conservation of energy through thermodynamic cycle. Also, the student must know the relation between the different units used through this Course.
COURSE OUTLINE

Week Number 1: Introduction to thermodynamics.

Week Number 2: Reversibility and reversible work.

Week Number 3: First law of thermodynamics’ Non-flow equation.

Week Number 4: Steady flow equation.

Week Number 5: Working Fluid (1.1) (steam).

Week Number 6: Working Fluid (1.2) (steam).

Week Number 7: Working Fluid (2.1) (perfect gas).

Week Number 8: Working Fluid (2.2) (perfect gas).

Week Number 9: Reversible processes,(constant volume, constant pressure).

Week Number 10: Reversible processes (constant temperature, adiabatic).

Week Number 11: Reversible process (polytropic).

Week Number 12: Second law of thermodynamics (1).

Week Number 13: Second law of thermodynamics (2).

Week Number 14: Heat transfer (1).

Week Number 15: Heat transfer (2).

Week Number 16: Final Exam.

TOOLS REQUIRED:

Use of the steam tab
BA 118 – Chemistry

Course Information

Course Title: Chemistry.
Code: BA118.
Hours: Lecture – 2 Hrs. Laboratory – 2 Hrs. Credit – 2.
Prerequisite: None.

Grading

Lab., Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description

The Science of Chemistry characterized its close relate with the other branches of sciences and with the technological applicants of these sciences and with technological applicants of these sciences, which emerge in the mineral oil, medicate, petroleum, petrochemicals, chemical textile and other industries. This course includes topics of specialized chemical engineering technology without going through details.

Text Books & References

- Drew principles of industrial water treatment. Third edit. Drew chemical corporat.

Course Aim

The aim of course develops for the student, bases of scientific engineering chemistry, and creative student’s scale to identify the technical problems which are related to engineering chemistry.

Course Objectives

Establishing a base for students. Providing the student with knowledge about the effects of the environment on the material whatever its form is indifferent purposes. Accruing Scientific bases
which equality the student to control dominate and protect the used materials. Enabling the student to solve industrial problems in a scientific method.

**COURSE OUTLINE**

<table>
<thead>
<tr>
<th>Week Number</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electrochemical Reactions and cells, volumetric Analysis (Practical).</td>
</tr>
<tr>
<td>2</td>
<td>Principles of corrosion, Titrate Technique, Determine of acidity (practical).</td>
</tr>
<tr>
<td>3</td>
<td>Metals and corrosive Environments, Determine of Alkalinity and chloride (practical).</td>
</tr>
<tr>
<td>4</td>
<td>Forms of corrosion uniform, Galvanic and Differential aeration cell, Determine of Hardness (Practical).</td>
</tr>
<tr>
<td>5</td>
<td>Pitting, stress corrosion cracking and intergranular corrosion forms, Determine of Dissolved oxygen (Practical).</td>
</tr>
<tr>
<td>6</td>
<td>Atmospheric and Erosion Corrosion, Spectrophotometer Analysis (Practical).</td>
</tr>
<tr>
<td>7</td>
<td>Coating and inhibitors as protection methods, Determine of nitrite and nitrate (Practical).</td>
</tr>
<tr>
<td>8</td>
<td>Cathodic protection, Determine of phosphate and silica (Practical).</td>
</tr>
<tr>
<td>9</td>
<td>Classification of fuel, properties of liquid fuel, Determine of some heavy Metals (Practical).</td>
</tr>
<tr>
<td>10</td>
<td>Combustion of fuel, Determine of fluorine and chlorine (Practical).</td>
</tr>
<tr>
<td>11</td>
<td>Air supply and Exhaust Gases, Determine of turbidity (Practical).</td>
</tr>
<tr>
<td>12</td>
<td>Classification of lubricants, Advantages and disadvantages of different types, Oil Analysis Determine of Viscosity and T.B.N (Practical).</td>
</tr>
<tr>
<td>13</td>
<td>Properties of lubricants and Additives, Determine of Insoluble and Saltwater (Practical).</td>
</tr>
<tr>
<td>15</td>
<td>Water Treatment, Determine of PH (Practical).</td>
</tr>
<tr>
<td>16</td>
<td>Air and water pollution, Determine of TDS and salinity (Practical).</td>
</tr>
</tbody>
</table>
BA 123 – Mathematics (1)

**Course Information**

Course Title: Mathematics (1).

Code: BA123.


Prerequisite: None.

**Grading**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

**Course Description**

The aim of this course is the differentiation and some of its applications, basic differentiable functions of one variable. It includes definitions and intuitive meanings of derivatives; Higher derivatives; Basic techniques of differentiation; Chain Rule; Parametric equations; Partial differentiation; Implicit differentiation; Inverse function theorem; Logarithmic differentiation; differentiation; Logarithmic functions; Exponential functions; Trigonometric functions; Inverse trigonometric functions; Hyperbolic functions; Differentiation of those; Physical and geometric applications of differentiation; Limits; Nth derivative; L'Hôpital rule; Maclaurin’s expansion as approximations of functions; Analytic geometry; Translation of Axes; Conic sections.

**Text Books**

- Printed Notes.

**Reference Books**


**Course Aim**

This course teaches students main transcendental functions and their basic properties, differentiation and some of its applications; as well as analytic geometry and quadratic curves.
COURSE OBJECTIVES

The course teaches basic transcendental functions and their properties. It develops students’ skills in the techniques of differentiation, and enables them to grasp its intuitive meaning. It also provides them with essential knowledge and skills in analytic geometry.

COURSE OUTLINE

Week Number 1: Basic techniques and rules of differentiation.

Trigonometric function: properties, basic identities and their derivatives.

Inverse of trigonometric and their derivatives.

Week Number 2: Logarithmic functions: their properties, basic identities and derivatives.

Week Number 3: Exponential functions: their properties, basic identities and derivatives.

Derivative of hyperbolic functions and their inverse.

Week Number 4: Parametric differentiation and implicit differentiation.

Week Number 5: The Nth derivative.

Week Number 6: L’ Hopital rule.

Week Number 7: Partial differentiation.

Week Number 8: Maclaurin’s expansion.

Week Number 9: Physical application.

Week Number 10: Curve sketching.

Week Number 11: Conic sections.

Week Number 12: General revision.

Week Number 13: Final Exam.
Course Title: Mathematics (2).

Code: BA124.


Prerequisite: BA123

Grading

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

Course Description

This course addresses integration and some of its geometric applications, as well as elementary matrix algebra. It includes definitions and intuitive meanings of indefinite and definite integrals; Fundamental Theorem of Calculus; Basic techniques of integration; Integration by parts; Geometric applications; Integration of powers of trigonometric functions; Substitution; Miscellaneous and Trigonometric substitutions; Integration of rational functions in x through partial fractions; Numerical Integration. Gauss’ method for the solution of linear equations; Matrix inversion and its use in the solution of linear equations.

Text Books

- Printed Notes.

Reference Books


Course Aim

To learn integration using different methods. To use these techniques in solving some application like to find the area, the volume, the length of a curve, and the average of a curve. To solve problems using numerical integration. To learn elementary linear algebra, solution of linear equations using matrices and determinants.
COURSE OBJECTIVES

The course develops students’ skills in the techniques of integration, and enables them to grasp its intuitive meaning. It also provides them with essential knowledge and skills in matrix algebra.

COURSE OUTLINE

Week Number 1: Definition of indefinite integrals and table of famous integrals.
Week Number 2: Simple rules of integration and the fundamental theorem of calculus.
Week Number 3: Fundamental theorem of calculus and integration by parts.
Week Number 4: Integration by parts and integration of rational functions.
Week Number 5: Integration of rational functions.
Week Number 6: Integration of trigonometric powers.
Week Number 7: Trigonometric substitution and 7th week exam.
Week Number 8: Integration of quadratic forms and the reduction formulas.
Week Number 9: Definite integration.
Week Number 10: Area and volume.
Week Number 11: Area, volume and length of curve.
Week Number 12: Average of a function, numerical integration and 12th week exam.
Week Number 13: Matrix Algebra.
Week Number 14: Solution of systems of linear equations.
Week Number 15: General revision.
Week Number 16: Final Exam.
BA 141 – Engineering Mechanics (1)

Course Title: Engineering Mechanics (1).

Code: BA141.


Prerequisite: None.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description


Text Books


Reference Books

Books available in the AAST Library

Course Aim

The aim of the course is to provide the student with an introduction to many of the fundamental concepts in Mechanics.

Course Objectives

The course treats only rigid-body mechanics, science it forms a suitable basis for the design and analysis of many types of structural, mechanical or electrical devices encountered in engineering.

Course Outline

Week Number 1: Rectangular components of a force.
Week Number 2: Parallelogram law.
Week Number 3: Equilibrium of particle – springs and cables.

Week Number 4: Moment of force.

Week Number 5: Free body diagram.

Week Number 6: Equilibrium of rigid body.

Week Number 7: Exam # 1.

Week Number 8: Trusses “joint method – zero – force members”.

Week Number 9: Trusses “method of section”.

Week Number 10: Frames.

Week Number 11: Frames (cont.).

Week Number 12: Exam # 2.

Week Number 13: Friction

Week Number 14: Mass Moment of Inertia

Week Number 15: Virtual work

Week Number 16: Final Exam.
BA 142 – Engineering Mechanics (2)

**Course Information**

Course Title: Engineering Mechanics (2).

Code: BA142.


Prerequisite: BA141.

**Grading**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

**Course Description**

Introduction of the kinematics of the particle, rectilinear and projectile motions, force and acceleration. Moreover, work and energy of a particle, rotation of a body about a fixed axis, general plan motion, relative velocity and acceleration, equations of translation – rotational.

**Text Books**


**Reference Books**

Books available in the AAST Library.

**Course Aim**

The aim of the course is to provide a clear and thorough presentation of the theory and applications of engineering mechanics.

**Course Objectives**

The course objectives are to study the geometry of motion (Kinematics) as well as the relationship between the motion of a body and the forces and the moments acting on it (Kinetics).

**Course Outline**

*Week Number 1:* Kinematics of a particle – Rectilinear Kinematics.

*Week Number 2:* Curvilinear Motion – Projectile Motion.
Week Number 3: Force & Acceleration (Kinetics).

Week Number 4: Work & Energy of a particle (Kinetics).

Week Number 5: Rotation of a Rigid Body about a fixed Axis.

Week Number 6: General Plan Motion.

Week Number 7: Exam # 1.

Week Number 8: Relative Motion (Velocity).

Week Number 9: Relative Motion (Acceleration).

Week Number 10: Planar Kinetics of Rigid Body – Equation of Translation Motion.

Week Number 11: Equation of Rotational Motion.

Week Number 12: Exam # 2.

Week Number 13: Equation of General Plane Motion.

Week Number 14: Work and Energy.

Week Number 15: Revision.

Week Number 1: Final Exam.
BA 223 – Mathematics (3)

COURSE INFORMATION

Course Title: Mathematics (3).

Code: BA223.


Prerequisite: BA124 – Mathematics (2).

GRADING

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

COURSE DESCRIPTION

Solving first order differential equations: Separable of variables, Homogeneous equation, Exact equation, Linear equation and Bernoulli’s equation. Solving second order homogeneous and non-homogeneous differential equations with constant and variable coefficients. Undetermined coefficients and variation of parameters methods. Laplace transformations, basic properties, first shifting theorem, unit step function, second shifting theorem, transform of derivatives and integrals, and inverse Laplace transforms. Solving differential equations by using Laplace transform. Fourier series: Fourier series for even, odd, and harmonic functions.

TEXT BOOKS


REFERENCE BOOKS


COURSE AIM

To study varies methods of solving differential equations, which arise as mathematical modeling in many topics of engineering.
COURSE OBJECTIVES

To study differential equations, Laplace transform and Fourier analysis, that is of fundamental importance in modern engineering and science.

COURSE OUTLINE

Week Number 1: Solving first order differential equations: Separable of variables and Homogeneous equation.

Week Number 2: Solving first order differential equations: Exact and Linear equations.

Week Number 3: Solving first order differential equations: Bernoulli's equation and revision on first order differential equations.

Week Number 4: Solving second order homogeneous differential equations with constant coefficients. Method of undetermined coefficients.

Week Number 5: Solving second order non-homogeneous differential equations with constant coefficients. Method of variation of parameters.

Week Number 6: Continue method of variation of parameters. Solving second order differential equations with variable coefficients (Euler's equation).

Week Number 7: Laplace transform: Basic definition, First shifting theorem.

Week Number 8: Laplace transform: Transform differentiation and integration.

Week Number 9: Unit step function, second shifting theorem, and convolution theorem.

Week Number 10: Inverse Laplace transforms.

Week Number 11: Solving differential equations by using Laplace transform.

Week Number 12: Fourier series: Fourier series for functions of period 2P.

Week Number 13: Fourier series for even and odd functions.

Week Number 14: Fourier series for harmonic functions.

Week Number 15: Revision.

Week Number 16: Final Exam.
**BA 224 – Mathematics (4)**

**COURSE INFORMATION**

Course Title: Mathematics (4)

Code: BA 224


Prerequisite: BA 223 – Mathematics (3)

**GRADING**

- Class Performance/Attendance: 10%
- Midterm # 1/Assignments – (7th Week): 30%
- Midterm # 2/Assignments – (12th Week): 20%
- Final Exam: 40%

**COURSE DESCRIPTION**

This course gives a comprehensive study on the 2D and 3D vectors: algebra, differential and integral calculus, and the physical interpretation of the integral theorems. The course also gives a study on the complex functions, its differentiation and integration, the residue theorems and its application to real integrals.

**TEXT BOOKS**


**REFERENCE BOOKS**


**COURSE AIM**

This course aims at enhancing the students knowledge in the subject of “Vector Differential and Integral calculus” as well as Complex Analysis and Integration needed to solve engineering problems at higher level of the undergraduate engineering studies.

**COURSE OBJECTIVES**

Through this course the student gets to know:

- Vector Differential Calculus
- Vector Integral calculus
- Complex Analytic Functions and Complex Integration.
### Course Outline

<table>
<thead>
<tr>
<th>Week Number</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vector Algebra / Dot and cross product and Applications.</td>
</tr>
<tr>
<td>2</td>
<td>Partial Differentiation / and Derivatives of vector functions.</td>
</tr>
<tr>
<td>3</td>
<td>Gradient / Divergence / curl / Laplacian.</td>
</tr>
<tr>
<td>4</td>
<td>Line Integrals / line Integrals Independent of the path / Exactness.</td>
</tr>
<tr>
<td>5</td>
<td>Conservative vector fields.</td>
</tr>
<tr>
<td>6</td>
<td>Double Integrals in Cartesian and polar coordinates / Green’s Theorem.</td>
</tr>
<tr>
<td>7</td>
<td>Surface Integrals / Stokes’ Theorem / 7th week Exam.</td>
</tr>
<tr>
<td>8</td>
<td>Triple Integrals / Divergence (Gauss’ Theorem).</td>
</tr>
<tr>
<td>9</td>
<td>Review on Integrals Theorems.</td>
</tr>
<tr>
<td>10</td>
<td>Complex numbers and functions / forms of representation.</td>
</tr>
<tr>
<td>11</td>
<td>Analytic functions / Harmonic functions.</td>
</tr>
<tr>
<td>12</td>
<td>Line complex integrals / Cauchy’s Integrals Theorem / 12th week Exam.</td>
</tr>
<tr>
<td>13</td>
<td>Zeros and poles of Analytic functions / Residues and their evaluation.</td>
</tr>
<tr>
<td>14</td>
<td>Residue Theorem / Application to Real Integral.</td>
</tr>
<tr>
<td>15</td>
<td>Introduction to Fourier Integrals and Transforms.</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam.</td>
</tr>
</tbody>
</table>
BA 323 – Mathematics (5)  

Course Title: Mathematics (5).  

Code: BA 323.  


Prerequisite: BA 224 – Mathematics (4).  

Grading  

Class Performance/Attendance: 10%  

Midterm # 1/Assignments – (7th Week): 30%  

Midterm # 2/Assignments – (12th Week): 20%  

Final Exam: 40%  

Course Description  

In the first of this course we discuss the solution of ordinary differential equations with variable coefficients using Taylor’s, power series and Frobenius methods, then we go into some special differential equations, as Legendre and Bessel differential equations which lead us to some special functions, as Legendre, Bessel, Gamma and Beta functions. After that we study the method of separation of variables to solve partial differential equations that help us to study some applications like heat transfer in a bar, vibrating of a string and potential fields. In the last of this course we discuss some special complex transformations, conformal mappings, such as bilinear and Schwarz Christoffel transformations.  

Text Book  


Reference Books  

COURSE AIM

When dealing with some physical problems, an ordinary or partial differential equation arises. Our course aims to give the student the ability to extract exact solutions of these problems.

COURSE OBJECTIVES

Upon completion of this course the student will be able to:

- Solve ordinary differential equations with variable coefficients.
- Solve partial differential equations with the method of separation of variables.
- Deal with some special functions.
- Construct some special complex functions.

COURSE OUTLINE

Week Number 1: Taylor's and Power series methods for solving ordinary differential equations.

Week Number 2: Differential equation with variable coefficients, ordinary and singular points, solution about ordinary points.

Week Number 3: Solution about singular points: Regular singular points, the method of Frobenius - Case I.

Week Number 4: The method of Frobenius - Case II and Case III.

Week Number 5: Gamma and Beta functions.

Week Number 6: Legendre differential equation and Legendre polynomials.

Week Number 7: Bessel differential equation.

Week Number 8: Bessel function of the 1st kind.

Week Number 9: Boundary value problems, partial differential equations and the method of separation of variables.

Week Number 10: Heat equation - heat transfer in a bar.

Week Number 11: Wave equation - vibration of a string.

Week Number 12: Laplace equation and potential fields.

Week Number 13: Conformal mappings - Complex functions as mappings.

Week Number 14: Bilinear transformations – linear fraction transformation.

Week Number 15: Schwarz Christoffel transformation.

Week Number 16: Final Exam.
BA 326 – Mathematics (6)

COURSE INFORMATION

Course Title: Mathematics (6).
Code: BA 326.

Hours:
- Lecture – 2 Hrs.
- Tutorial – 2 Hrs.
- Credit – 3.

Prerequisite: BA 124 – Mathematics (2).

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

COURSE DESCRIPTION

This course provides a comprehensive knowledge about descriptive statistics and the use of computer statistical packages. Statistical methods of estimation and hypothesis testing. Emphasis on use, validity and understanding of particular statistical models. This course also introduces students to probability, conditional probability; independent event total probability, Bayes theorem and basic counting techniques and random variables. Topics include distribution functions, binomial, geometric and Poisson distributions. The other topics covered are uniform, exponential and normal distributions; joint distributions. An introduction about Random Processes: Definition and classification, stochastic integrals, Fourier transforms of random processes, stationary and non-stationary processes, correlation functions. Power spectral density, transformations of random processes by linear systems.

TEXT BOOKS

Mahmoud Gaber, Probability and statistics for engineering student.

REFERENCE BOOKS


COURSE AIM

This course provides a straightforward introduction on the Statistical analysis and the theory of probability and Random process without burdening the student with a great deal of measure theory.
In particular, a principal purpose of the course is to help to build up the important Skills necessary for solving problems.

**COURSE OBJECTIVES**

Through this course the student gets to know how:

- To make statistical analysis and calculating statistical measurements using computer programs like the Minitab program or Excel.
- To introduce the basic ideas of probability and conditional probability and its dependence. It is assumed that the outdone has some knowledge of elementary set theory.
- To introduce discrete and continues random variable and for this need a knowledge of the simpler techniques of calculus desirable.
- To introduce the joint distribution in order to study simple application to random process and signal principles.

**COURSE OUTLINE**

*Week Number 1:* An introduction to Statistics and statistical analysis on data observation.

*Week Number 2:* Statistical measurements.

*Week Number 3:* Elementary probability-Probability theorems.

*Week Number 4:* Conditional probability-Independent and dependent events.

*Week Number 5:* Total probability rule - Bayes Theorem and enumeration methods.

*Week Number 6:* Discrete probability distribution-probability mass function.

*Week Number 7:* Continuous probability distribution -probability density function.

*Week Number 8:* Mathematical expectation, mean and variance.

*Week Number 9:* Special discrete distribution: Bernoulli, Binomial, Geometric and Poisson distributions.

*Week Number 10:* Special continuous distribution: Uniform and exponential distribution.

*Week Number 11:* Special continuous distribution: normal distribution.

*Week Number 12:* Discrete and Continuous joint probability distribution.


*Week Number 15:* Final revision.

*Week Number 16:* Final exam.
Course Title: Digital Logic Design
Code: CC 216
Hours: Lecture – 2 Hrs.  Tutorial/Lab – 2/2  Hrs.  Credit – 3.
Prerequisite: CC 111.

Grading
Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description
Number systems - binary arithmetic and codes - logic gates - Boolean algebra and logic simplifications - Design and realization of combinational circuits - Functions of combinational circuits logic - Flip-Flops - analysis design and realization of counters - analysis and realization of shift registers - Computer aided engineering.

Text Book

Reference Books
- Texas Instruments Data Sheets, latest version.

Course Aim
To develop engineering skills in the design and analysis of digital logic circuits with applications to digital computer.

Course Objectives
Upon completion of this course the student will be able to:
- Knowing the basic differences between analog and digital systems
- Use binary numbers and codes
- Describe the operation of logic gates
- Applying Boolean algebra on K-map
- Design a combinational and sequential logic circuits to simplify function

COURSE OUTLINE

Week Number 1: Introduction to digital concepts.
Week Number 2: Number systems, operations, and codes.
Week Number 3: Logic gates.
Week Number 4: Boolean algebra and logic simplification – part 1.
Week Number 5: Boolean algebra and logic simplification – part 2.
Week Number 6: Functions of combinational logic.
Week Number 7: 7th week exam.
Week Number 8: Decoders, encoders, MUX, DMUX – part 1.
Week Number 9: Decoders, encoders, MUX, DMUX – part 2.
Week Number 12: 12th week exam.
Week Number 13: Flip-Flops applications.
Week Number 14: Counters.
Week Number 15: Shift registers.
Week Number 16: Final Exam.
CC 312 – Computer Organization

Course Information

Course Title: Computer Organization
Code: CC 312
Prerequisite: CC 216.

Grading

Class Performance/Attendance: 10%
Midterm #1/Assignments – (7th Week): 30%
Midterm #2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description

Computer interconnection structures - computer components - computer function interconnection structures - bus interconnection. - Internal and external memory - computer memory system overview - semiconductors main memory - cache memory - magnetic tape - optical memory - Input / Output - I/O modules - programmed I/O - interrupt-driven I/O - direct memory Access - Operating system - Operating systems overview – scheduling - memory management - The central processing unit - Computer Arithmetic - characteristics and functions of instruction sets - addressing modes - processor organization - the instruction cycle - instruction pipelining - Control unit Micro-operation - hardware implementation - Control Functions.

Text Book


Reference Books


Course Aim

Introduce students to the basic knowledge necessary to understand the hardware operation of digital computers and covers the main subjects associated with computer hardware.

Course Objectives

Upon completion of this course the student will be able to:
Presenting the various digital components used in the organization and design of digital computers

Explaining the detailed steps that a designer must go through in order to design an elementary basic computer.

Introducing the organization and architecture of the main units of a digital computer.

**Course Outline**


*Week Number 3*: Digital Components.


*Week Number 5*: Register Transfer Organization & Micro-operation – part 2.

*Week Number 6*: Basic computer Organization and Design – part 1.

*Week Number 7*: Basic computer Organization and Design – part 2.

*Week Number 8*: Central Processing Unit – part 1.

*Week Number 9*: Central Processing Unit – part 2.

*Week Number 10*: Central Processing Unit – part 3.

*Week Number 11*: Memory Organization – part 1.

*Week Number 12*: Memory Organization – part 2.

*Week Number 13*: Memory Organization – part 3.


*Week Number 16*: Final Exam.
CC 411 – Introduction to Microprocessors

Course Title: Introduction to Microprocessors
Code: CC 411
Hours: Lecture – 2 Hrs.  Tutorial/Lab – 2/2 Hrs.  Credit – 3.
Prerequisite: CC 312 or CC216.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description

Microprocessors and microcomputers - Microcomputer structure – microprocessor – memory - buses (synchronous and asynchronous) - I/O - 16/32-bit microprocessor architecture - Instruction cycle – microinstructions - micro-programming - instruction decoding - Reduced Instruction Set computer (RISC) architecture - Complex Instruction Set computer (CISC) architecture - Memory (RAM, ROM, memory mapping of I/O) - I/O (parallel and serial I/O interfaces, system clock, clock phases and bit rates) - Interrupts (types, handling of interrupts) - Software aids (text editors and assemblers, linkers and macro-assemblers).

Text Book


Reference Books


Course Aim

Identify The Microprocessors Category and study the internal structure and external connections of an example microprocessor (Intel 80386).

Course Objectives

Upon completion of this course the student will be able to Work with the Intel 80386 microprocessor, its connected peripherals, and its assembly language format.
## COURSE OUTLINE

- **Week Number 1**: Introduction to microprocessors Historical background.
- **Week Number 2**: 80386 Microprocessor architecture.
- **Week Number 3**: Real mode software model.
- **Week Number 4**: Addressing modes.
- **Week Number 5**: The instruction set & Machine Language coding.
- **Week Number 6**: Protected mode Architecture Model.
- **Week Number 7**: 7th week exam.
- **Week Number 8**: Virtual memory Management.
- **Week Number 9**: Memory Interface.
- **Week Number 10**: DRAM.
- **Week Number 11**: Input/output interface.
- **Week Number 12**: 12th week exam.
- **Week Number 13**: Interrupts and exception processing.
- **Week Number 14**: The 486 and Pentium microprocessors family.
- **Week Number 15**: Revision.
- **Week Number 16**: Final Exam.
CC 524 – Neural Networks

Course Title: Neural Networks
Code: CC 524

Prerequisite: CC 112 – BA323.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description


Introduction to MATLAB environment. Single perceptron, Multilayer perceptron, Competitive networks, Kohonen networks, ART networks, And Hopfield networks using MATLAB.

Text Book


Reference Books


Course Aim

This course will provide students with detailed skills to use Artificial neural networks for solving many types of engineering problems such as mapping, clustering, and constrained optimization, in such areas as pattern recognition, signal processing, and control systems.
COURSE OBJECTIVES

Upon completion of this course the student will be able to:

- Explain the basic concepts of neural networks.
- Discuss a wide variety of neural networks with architecture, training, algorithms, and applications.
- Demonstrate the architecture, training, and applications of a wide variety of neural networks using MATLAB simulation package.

COURSE OUTLINE

Week Number 1: Introduction to basic concepts of neural networks.
Week Number 2: The basic neuron.
Week Number 3: The multilayer perceptron.
Week Number 4: Artificial neural networks: applications, learning rules, and architecture.
Week Number 5: Competitive neural networks.
Week Number 6: Kohonen self-organizing networks.
Week Number 7: Adaptive reasoning theory (ART) – part 1.
Week Number 8: Adaptive reasoning theory (ART) – part 2.
Week Number 9: Hopfield neural networks.
Week Number 10: Neural networks implementation.
Week Number 11: Neural networks applications – part 1.
Week Number 12: Neural networks applications – part 2.
Week Number 13: Neural networks applications – part 3.
Week Number 14: Neural networks applications – part 4.
Week Number 15: Neural networks applications – part 5.
Week Number 16: Final Exam.
CC 527 – Computer Aided Design

COURSE INFORMATION

Course Title: Computer Aided Design
Code: CC 527
Prerequisite: CC 311 – CC 341.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

COURSE DESCRIPTION

To introduce fundamental algorithms and techniques for computer aided integrated circuit design. It covers aspects of design flow, physical design, logic optimization, timing analysis and verification, synthesis for testability.

TEXT BOOK


REFERENCE BOOKS

- Computer Aids for VLSI Design, Rubin S., Addison – Wesley

COURSE AIM

To learn new design technologies, large-scale designs using VLSI technology and modern computer techniques used in Digital circuit designs & implementation.

COURSE OBJECTIVES

Upon completion of this course the student will be able to produce highly qualified and skilled engineers who can cope with state of the art technologies in digital circuit design & implementation.
COURSE OUTLINE

Week Number 1: Introduction to CMOS Circuits.

Week Number 2: Circuit & system Representation.

Week Number 3: Circuit Characterization.

Week Number 4: Circuit performance estimation.

Week Number 5: Interconnect and Wiring.

Week Number 6: Combinational Circuit Design.

Week Number 7: 7th week Exam.

Week Number 8: Sequential Circuit Design.

Week Number 9: Design methodology and Tools.

Week Number 10: Datapath subsystems.

Week Number 11: Datapath subsystems.

Week Number 12: 12th week Exam.

Week Number 13: Design tools I.

Week Number 14: Design tools II.

Week Number 15: Revision.

Week Number 16: Final Exam.
Computer Sciences College – CS

CC 413 – Numerical Analysis

Course Information

Course Title: Numerical Analysis
Code: CC 413
Prerequisite: CC 112 - BA224.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description

Introduction to numerical methods and their applications - solve science and engineering problems - convergence - error analysis of numerical methods.

Text Book


Reference Books


Course Aim

Allow students to master the approximation techniques used in numerical solutions that arise in science and engineering problems. Teach students why numerical methods work, what type of errors to expect and when an application might lead to difficulties.

Course Objectives

Upon completion of this course the student will be able to:
Introduction to numerical methods and errors of computers, errors analysis, error propagation, roots of equations of one variable linear equations, Eigen values and Eigen vectors.

Numerical differentiation, integration, interpolation, least square error, and regression.

**Course Outline**

*Week Number 1:* Solution of equations of one variable: Bisection method, False Position method, and secant method.

*Week Number 2:* Solution of equations of one variable: Successive Approximation method, and modified Successive Approximation method.

*Week Number 3:* Solution of equations of one variable: Newton Raphson method and nearly equal roots.

*Week Number 4:* Solution of equations of one variable: Berge Vieta method (of roots of polynomials).

*Week Number 5:* Error Analysis and Propagation: Types and sources of errors and ill-conditioning and instability.

*Week Number 6:* Error Analysis and Propagation: Process graphs, error propagation with examples.

*Week Number 7:* Solutions of linear equations: (Direct Methods) Gauss elimination and Gauss Jordan methods.

*Week Number 8:* Solutions of linear equations: (Direct Methods) Gauss Jordan method for Integral matrices.

*Week Number 9:* Solutions of linear equations: (Indirect Methods) Jacobi, Gauss Siedel, and conditions of convergence.

*Week Number 10:* Matrix Inversion using direct methods for solution of linear equations. Eigen values.

*Week Number 11:* Numerical Interpolation (Linear, Quadratic, and Lagrange polynomials).

*Week Number 12:* Numerical Differentiation and Integration (Mid-point integration).

*Week Number 13:* Numerical Integration (Trapezoidal, Simpson, and Gaussian integration).

*Week Number 14:* Linear and Quadratic regression.

*Week Number 15:* Lagrange regression and revision.

*Week Number 16:* Final Exam.
CC 111 – Introduction to Computers

Course Title: Introduction to Computer Science.
Code: CC111.
Hours: Lecture – 1 Hrs. Laboratory – 2 Hrs. Credit – 2.
Prerequisite: none.

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description

This course provides an introduction to computers and computing. Topics of interest include the impact of computers on society, ethical issues, and hardware/software applications, including internet applications, system unit, storage and input/output devices, numbering systems, system and application software, presentation skills, program development, programming languages, and flow charts, Visual Basic, web page design using HTML, and communications and networks.

Text Books


Reference Books


Course Aim

- The students must have a general understanding of what computers are and how they operate.
- The students must have good skills in using windows, MS PowerPoint, HTML and Visual Basic.
- The students must learn problem solving techniques and program development.
- The student should know the available programming languages and their capabilities.
COURSE OBJECTIVES

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

- Identify computer hardware components and their specifications and types.
- Use Windows, MS PowerPoint, HTML, and Visual Basic.
- Understand and use numbering systems.

COURSE OUTLINE

Week Number 1: Introduction to the World of Computers Input and Output.

Week Number 2: The System Unit: Processing and Memory.

Week Number 3: Storage and Input/Output Devices

Week Number 4: System Software and Application Software

Week Number 5: Quiz 1+ Program Development, Programming Languages, and Flow charts

Week Number 6: Visual Basic 1

Week Number 7: 7th Week Exam

Week Number 8: Visual Basic 2

Week Number 9: Visual Basic 3

Week Number 10: Quiz 2 + Web page design using HTML 1

Week Number 11: Web page design using HTML 2

Week Number 12: 12th Week Exam

Week Number 13: Communications and Networks 1

Week Number 14: Communications and Networks 2

Week Number 15: Ethics, Computer Crime, Privacy, and other Social Issues

Week Number 16: Final Exam
**CC 112 – Structured Programming**

**Course Information**

Course Title: Structured Programming.

Code: CC112.

Hours: Lecture – 2 Hrs. Laboratory – 2 Hrs. Credit – 3.

Prerequisite: CC111.

**Grading**

- Class Performance/Attendance: 10%
- Midterm # 1/Assignments – (7th Week): 30%
- Midterm # 2/Assignments – (12th Week): 20%
- Final Exam: 40%

**Course Description**

An introduction to C-language Programming is provided in this course, Variable/Constant definitions, Basic Programmes, Sequential Programming, Conditional Programming, Looping and repetitions, Functions, Arrays as well as searching and sorting techniques.

**Text Books**

J.Hanly and E. Koffman, "C Program Design for Engineers", Addison Wesley, latest edition

**Reference Books**


**Course Aim**

Introducing Structured programming techniques associated with the C-Language, used to program most nowadays systems. Studying their application to practical problems with special emphasis on some practical applications concerning different disciplines.

**Course Objectives**

Studying C-language programming techniques, sequence, selection and repetition control structures, functions, Arrays, sorting and searching techniques.

**Course Outline**

*Week Number 1:* Overview of Programming and Problem Solving

*Week Number 2:* C Syntax and Semantics
Week Number 3: I/O Formatting and Arithmetic

Week Number 4: Conditions and Logical Expressions

Week Number 5: Selection Control Structures

Week Number 6: Repetitions (Part 1)

Week Number 7: 7th Week Exam

Week Number 8: Repetitions (Part 2)

Week Number 9: Functions (Part 1)

Week Number 10: Functions (Part 2)

Week Number 11: Arrays (Part 1)

Week Number 12: 12th Week Exam

Week Number 13: Arrays (Part 2)

Week Number 14: Programming applications – problem solving Tech (Part 1)

Week Number 15: Programming applications – problem solving Tech (Part 2)

Week Number 16: Final Exam.
CC 213 – Programming Applications
COURSE INFORMATION

Course Title: Programming Applications
Code: CC 213
Prerequisite: CC 112.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

COURSE DESCRIPTION

An advanced C-language Programming is provided in this course: two dimensional arrays, strings, pointers, recursion, structures, bitwise-operators, input-output interfacing as well as text and binary files are covered in details. Projects are required from students to increase their skills in C programming.

TEXT BOOK


REFERENCE BOOKS


COURSE AIM

Introducing different programming techniques associated with the C-Language, used to program most nowadays systems. Studying their application to practical problems with special emphasis on some practical applications concerning different disciplines.

COURSE OBJECTIVES

Upon completion of this course the student will be able to:

- Studying C-language programming techniques, files, pointers, structure, string, and array.
COURSE OUTLINE

Week Number 1: Revision of structured programming constructs: selection, repetition, and Functions.

Week Number 2: Revision of one dimensional array.

Week Number 3: Searching and sorting.

Week Number 4: Two dimensional arrays.

Week Number 5: Pointers.

Week Number 6: Strings.

Week Number 7: 7th week exam.

Week Number 8: Structures.

Week Number 9: Structures/Unions.

Week Number 10: Recursion.

Week Number 11: Text Files.

Week Number 12: 12th week exam.

Week Number 13: Binary Files.

Week Number 14: Bitwise Operators/ I/O Interfacing.

Week Number 15: Advanced Applications.

Week Number 16: Final Exam.
Electrical and Control Engineering Courses – EE

EE 231 – Electrical Circuits (1)

Course Title: Electrical circuits (1)
Code: EE 231
Hours: Lecture – 2 Hrs. Tutorial/Lab – 2/2 Hrs. Credit – 3.
Prerequisite: BA 124

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description


Text Book


Reference Books


Course Objectives

To provide the students with the basic tools to analysis and solve for the currents and voltages in each branch of d-c circuits and to introduce the concepts of a-c circuits such as phasor, wave, and response.
COURSE OUTLINE

Week Number 1: Basic dc circuit elements, series and parallel Networks
Week Number 2: Ohm's law and Kirchoff's laws
Week Number 3: Nodal Analysis
Week Number 4: Mesh Analysis
Week Number 5: Electric circuit theorems "source transformation"
Week Number 6: Superposition
Week Number 7: Thevenin's Theorem and Norton Theorem
Week Number 8: Maximum power transfer
Week Number 9: Alternating current Fundamentals and AC generation
Week Number 10: RMS value, average value, form factor and crisp factor
Week Number 11: Phasor concept
Week Number 12: Relation between voltage and current in resistor, capacitor and inductor
Week Number 13: Response of RL and RC circuits
Week Number 14: Sinusoidal response of RLC circuit
Week Number 15: Series Resonance
Week Number 16: Final exam
EE 232 – Electrical Circuits (2)

COURSE INFORMATION

Course Title: Electrical circuits (2)

Code: EE 232

Hours: Lecture – 2 Hrs.  Tutorial/Lab – 2 Hrs.  Credit – 3.

Prerequisite: EE 231

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

COURSE DESCRIPTION


TEXT BOOK


REFERENCE BOOKS


COURSE OBJECTIVES

Enhancement of skills related to AC circuit analysis, three phase circuit balanced and unbalanced load and the natural response of R-L and R-C circuits.

COURSE OUTLINE

Week Number 1: A.C. series circuit and series resonance revision Y - Δ transformation.

Week Number 2: Source transformation and Node Voltage method.
Week Number 3: The mesh current method thevenin theorem.

Week Number 4: Complex power & Maximum Power Calculation

Week Number 5: Three Phase Systems

Week Number 6: Balanced Y- Y Circuit

Week Number 7: Y- Δ , Δ-Y , Δ-Δ 3 Phase Systems

Week Number 8: Power Calculation in 3 Phase System

Week Number 9: Unbalanced Δ Connected 3 Phase System

Week Number 10: Y 3 Phase unbalanced System

Week Number 11: Inductor and Capacitor

Week Number 12: Natural Response of R-L Circuit

Week Number 13: Natural Response of R-C Circuit

Week Number 14: Step Response of R-L & R-c Circuits

Week Number 15: Sequential Switching

Week Number 16: Final Exam
EE 328 – Electrical Power and Machines

Course Information

Course Title: Electrical Power and Machines
Code: EE 328
Hours: Lecture – 2 Hrs.  Tutorial/Lab – 2/2 Hrs.  Credit – 3.
Prerequisite: EE 232

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description


Text Book


Reference Books

C. Hubert, 'Electric Machines" Maxwell Macmillan, 1991

Course Objectives

- To investigate the different stages of power system generation and distribution.
- To study the basic concepts of transformers and 3-phase motors.
- To study the basic of power generation and single-phase and dc machines

Course Outline

Week Number 1: Revision on electric and magnetic circuits.
Week Number 2: The law of motor and generator action.
Week Number 3: DC Motors.
Week Number 4: DC Generators.
Week Number 5: Core Loss and transformer basics.
Week Number 6: Transformer model and regulation.
Week Number 7: 7th week + Transformer ratings and testing.
Week Number 8: AC rotating field.
Week Number 9: 3-phase induction motor.
Week Number 10: Synchronous machines.
Week Number 11: Single phase and small motors.
Week Number 12: 12th week + Electric power system.
Week Number 13: Plant distribution system.
Week Number 14: Protective devices and distribution of electricity in buildings.
Week Number 15: System protection & PF correction.
Week Number 16: Final Exam.
EE 418 – Automatic Control Systems

Course Information

Course Title: Automatic control systems
Code: EE 418
Hours: Lecture – 2 Hrs. Tutorial/Lab – 2/2 Hrs. Credit – 3.
Prerequisite: EE 218 OR EE 328

Grading

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

Course Description


Text Book


Reference Books

- Y. El Gamal A. Amer, “Introduction to Control Engineering”, AAST 1988
- K.O.Gaw, “Modern Control Engineering”, Prentice Hall New Delhi, 1984

Course Objectives

- Stability concept and time domain analysis using time and frequency response
- Modelling and analysis of simple physical system are investigated
- To study controller units, their type analysis and tuning

Course Outline

Week Number 1: Introduction to control system.
Week Number 2: Differential equation of physical systems.

Week Number 3: Block diagram models using MATLAB.

Week Number 4: Signal flow graph models using MATLAB.

Week Number 5: Test input signals.

Week Number 6: Performance of 1st and 2nd order system.

Week Number 7: 7th week + Effect of 3rd pole and a zero on the 2nd order system.

Week Number 8: Stability concept Routh-Hurwitz stability criterion.

Week Number 9: Root locus techniques.

Week Number 10: Bode plots.

Week Number 11: Nyquist plots.

Week Number 12: 12th week + Approaches to system design, advantage of feedback.

Week Number 13: Approaches to system design, advantage of feedback.

Week Number 14: Analog controllers.

Week Number 15: Analog controllers (2).

Week Number 16: Final Exam.
EE 419 – Modern Control Engineering

COURSE INFORMATION

Course Title: Modern control engineering
Code: EE 419
Hours: Lecture – 2 Hrs. Tutorial/Lab – 2 Hrs. Credit – 3.
Prerequisite: EE 418

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

COURSE DESCRIPTION


TEXT BOOK


REFERENCE BOOKS


COURSE OBJECTIVES

To enable the students to get acquainted with the classical methods of design the state space method of design for both continuous and discrete time systems.

COURSE OUTLINE

Week Number 1: Lead compensation design.
Week Number 2: Lag compensation design.
Week Number 3: Lag-Lead compensation design.

Week Number 4: Lead compensation by frequency response.

Week Number 5: Lag compensation by frequency response.

Week Number 6: Introduction to state-space.

Week Number 7: 7th week+ Methods of state space representation.

Week Number 8: Solution of state equation.

Week Number 9: Controllability – observability.

Week Number 10: State variable feedback.

Week Number 11: 12th week + Introduction to digital control systems.

Week Number 12: The z-transform

Week Number 13: Block diagram of digital systems.

Week Number 14: Time response of digital systems.

Week Number 15: Stability analysis for digital systems.

Week Number 16: Final Exam.
EE 512 – Automated Industrial Systems (1)

Course Title: Automated industrial systems (1)

Code: EE 512

Hours: Lecture – 2 Hrs. Tutorial/Lab – 2/2 Hrs. Credit – 3.

Prerequisite: EE 411 OR EE 418

Grading

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

Course Description

Automated hierarchical levels and components. Detecting sensors and actuating elements, relay logic and their applications. Introduction to PLC.S. Types of PLCs and construction. Hardware configuration and descriptions. Programming and testing basic functions. Programming and testing advanced functions. Industrial Applications using PLCs

Text Book


Reference Books


Course Objectives

To update the student on objectives, structures and behaviour of automated systems, programmable logic controllers and applications in industrial systems

Course Outline

Week Number 1: Automated hierarchical and components.

Week Number 2: Building blocks of automation.

Week Number 3: Data acquisition system.
Week Number 4: Multiplexing/De-multiplexing.

Week Number 5: Computers and industrial control.

Week Number 6: Introduction to PLC's.

Week Number 7: 7th week + Methods of representation.

Week Number 8: Programming or testing of basic function.

Week Number 9: Programming of advanced functions.

Week Number 10: PLC in industrial Applications.

Week Number 11: Industrial applications.

Week Number 12: 12th week + Control applications.

Week Number 13: Industrial control applications.

Week Number 14: Industrial control applications (2).

Week Number 15: PLCs applications.

Week Number 16: Final Exam.
Industrial and Management Engineering Courses – IM

**IM 111 – Industrial Relations**

**COURSE INFORMATION**

Course Title: Industrial Relations.

Code: IM 111.

Hours: Lecture – 1 Hr.  Tutorial – 0 Hrs.  Credit – 2.

Prerequisite: None.

**GRADING**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

**COURSE DESCRIPTION**

This course identifies the different types of industries, production techniques, management and organization structure, the different types of hazards and dangers and how to prevent them. Also it clarifies the meaning of production planning and control and cost calculations.

**TEXT BOOKS**

Lecture Notes

**REFERENCE BOOKS**


**COURSE AIM**

To introduce students to the basis knowledge and concepts related to industrialization and work organizations, industrial health and safety, and the history of engineering and technology.

**COURSE OBJECTIVES**

- Identify the different types of industries, production techniques, and management and organization structure.
- Understand the meaning of production planning and control and cost calculations.
- Understand and identify the different types of hazards and dangers and to prevent them.
COURSE OUTLINE

Week Number 1: Introduction to Course.

Week Number 2: Types of Industries and Production Techniques.

Week Number 3: Management and Organization Structure.

Week Number 4: Production Planning and Control.

Week Number 5: Industrial Cost Estimation Techniques.

Week Number 6: Industrial Economy and Breakeven Analysis.

Week Number 7: Exam # 1.

Week Number 8: Accidents at Work – Rules and Regulations.

Week Number 9: Hazards Classification, Prevention, and Personal Safety.

Week Number 10: Fire Hazards Identification and Prevention.

Week Number 11: Chemical Hazards and Prevention – Accident Reporting.

Week Number 12: Exam # 2.

Week Number 13: Quality Control and Labour Relations.

Week Number 14: Science, Engineering, and Technology.

Week Number 15: Industrial Revolutions.

Week Number 16: Final Exam.
**IM 112 – Manufacturing Technology**

**COURSE INFORMATION**

Course Title: Manufacturing Technology.

Code: IM 112.

Hours: Lecture – 1 Hr. Laboratory – 2 Hrs. Credit – 2.

Prerequisite: None.

**GRADING**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam 40%

**COURSE DESCRIPTION**

The course provides an introduction to engineering materials and their properties, production of common metals. It covers types of manufacturing, basic manufacturing processes such as casting, metal forming, welding and machining. An overview of some advanced manufacturing processes is also included. In addition, it introduces measurement standards, instruments, deviations and methods.

**TEXT BOOKS**


**REFERENCE BOOKS**


**COURSE AIM**

Introduce the different methods for processing engineering materials and get acquainted with the basic concepts and necessary information related to manufacturing techniques.
COURSE OBJECTIVES

Understanding the different stages or phases for engineering materials processing, learning the basic concepts of metal forming and casting, understanding the concepts of metal machining and welding techniques and associated applications, learning different measuring techniques and how they can be used for quality control purposes.

COURSE OUTLINE

Week Number 1: Production of steel and cast iron.
Week Number 2: Forming operations (Rolling – Drawing – Extrusion – Forging).
Week Number 3: Heat treatment operations (Hardening-Annealing-Tempering-Nor realizing).
Week Number 4: Cutting tools (Geometry & materials).
Week Number 5: Mechanics of metal cutting and turning operations.
Week Number 6: Cutting fluids (Function – Type – Selection).
Week Number 7: Exam # 1.
Week Number 8: Sand casting (Pattern design & mould preparations).
Week Number 9: Centrifugal casting, die casting and aspects of the casting process.
Week Number 10: Gas and Electric arc welding.
Week Number 11: Electric resistance and pressure welding and aspects of the welding process.
Week Number 12: Exam # 2
Week Number 13: Standards of measurements, Measuring Instruments.
Week Number 14: Measuring Instruments (Vernier, micrometer, dial gauge, block gauges).
Week Number 15: Measuring methods (Indirect and comparative measurements).
Week Number 16: Final Exam.
IM 423 – Operations Research  
COURSE INFORMATION

Course Title: Operations Research.  
Code: IM 423.  
Prerequisite: 90 Credit Hours.

GRADING

Class Performance/Attendance: 10%  
Midterm # 1/Assignments – (7th Week): 30%  
Midterm # 2/Assignments – (12th Week): 20%  
Final Exam: 40%

COURSE DESCRIPTION

The course provides the basic concepts and fundamentals of management science, problems addressed by operations research, and problem formulations in linear programs. It includes the graphical solution of linear programs, simplex method, transportation model, assignment model, network planning, and critical path and PERT methods.

TEXT BOOKS


REFERENCE BOOKS


COURSE OBJECTIVES

- To promote the scientific approach to solve management problems.  
- To build up capability to construct mathematical models of practical problems and solve them.  
- To acknowledge the role of computer technology in solving problem of operations research.

COURSE OUTLINE

Week Number 1: Course Overview.  
Week Number 2: Linear Programming.  
Week Number 3: Graphical Method.
Week Number 4: Linear Programming Applications.

Week Number 5: The Simplex Method.

Week Number 6: Transportations Method – Formulation and Initial Solution.

Week Number 7: 7th Week Exam.

Week Number 8: Transportations Method – Finding the Optimal Solution.

Week Number 9: Assignment Method.

Week Number 10: Critical Path Method.


Week Number 12: 12th Week Exam.

Week Number 13: Project Crashing

Week Number 14: Network Analysis – Shortest Route and Minimal Spanning Tree.

Week Number 15: Network Analysis – Maximal Flow.

Week Number 16: Final Exam.
IM 535 – International Operations Management

**Course Information**

Course Title: International Operations Management.

Code: IM 535.

Hours: Lecture – 3 Hrs.  Tutorial – 0 Hrs.  Credit – 3.

Prerequisite: 126 Credit Hours.

**Grading**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

**Course Description**

The course introduces the students to the concepts of international business environment, international trade and direct foreign investments, foreign exchange, and economic cooperation.

**Text Books**


**Reference Books**


**Course Objectives**

The objective of this course, which is a part of the college requirements, is to introduce the students from different disciplines to the ever-growing field of international business. It tackles the main issues of the evolution of firm strategy as part of the internationalization process, plus the countervailing forces that firms are likely to encounter during that process. In addition, the elements of the external international business environment are briefly introduced. The student will be better able to interact with the business world in the environment of globalization.

**Course Outline**

*Week Number 1:* International Business Environment- An overview.

*Week Number 2:* The Cultural and Legal Environment.

*Week Number 3:* The Political Environment.
Week Number 4: The Economic Environment Facing Business (1).

Week Number 5: The Economic Environment Facing Business (2).

Week Number 6: International Trade Theories (1).

Week Number 7: 7th week Exam.

Week Number 8: International Trade Theories (2).

Week Number 9: Governmental Influence on Trade.

Week Number 10: Regional Economic Integration.

Week Number 11: Factor Mobility and Foreign Direct Investment.

Week Number 12: 12th week Exam.

Week Number 13: The Foreign Exchange Market.

Week Number 14: The determination of Exchange Rates.

Week Number 15: Global Manufacturing and Supply Chain management.

Week Number 16: Final Exam.
Language, Humanities, & Social Science Courses – LH

**LH 131 – ESP I**  
**Course Information**

Course Title: ESP I.  
Code: LH 131.  
Hours: Lecture – 3 Hrs.  
Credit – 2.  
Prerequisite: None.

**Grading**

Class Performance/Attendance: 10%  
Midterm # 1/Assignments – (7th Week): 30%  
Midterm # 2/Assignments – (12th Week): 20%  
Final Exam: 40%

**Text Books**


**Reference Books**

References available in AAST Library.

**Course Aim**

The course aims at enhancing learners’ four language skills, improving their general and technical lexical repertoire and preparing them to communicate their ideas effectively. The course is also designed to train learners to follow the principles and stages of the writing process and write academic paragraphs.

**Course Objectives**

By the end of the course, learners will be able to:

- Use listening and reading strategies appropriately.  
- Communicate about a variety of technical topics orally.  
- Use basic computer terms and relevant general vocabulary meaningfully and accurately.  
- Apply word-formation rules of prefixation and suffixation.  
- Use some relevant grammatical structures.  
- Apply the stages of the writing process effectively.
Write well-structured, unified and coherent paragraphs.

**Course Outline**

*Week Number 1:* Orientation + Unit 1 (Personal Computing).

*Week Number 2:* Unit 1 (Personal Computing) + Unit 2 (Portable Computers).

*Week Number 3:* Unit 2 (Portable Computers).

*Week Number 4:* The process of academic writing.

*Week Number 5:* An overview of paragraph writing.

*Week Number 6:* Unit 3 (Suffixes) + Unit 4 (Programming and Languages) + Graded workshop.

*Week Number 7:* Unit 4 (Programming and Languages) + Progress Test I.

*Week Number 8:* Unity and Coherence.

*Week Number 9:* Coherence + Writing workshop.

*Week Number 10:* Unit 5 (Computer Software).

*Week Number 11:* Unit 6 (Computer Networks) + Graded workshop.

*Week Number 12:* Unit 7 (Computer Viruses) + Progress test II.

*Week Number 13:* Unit 7 (Computer Viruses).

*Week Number 14:* Unit 8 (Computers in the Office).

*Week Number 15:* Unit 8 (Computers in the Office) + General revision.

*Week Number 16:* Final exam.
**LH 132 – ESP II**

**COURSE INFORMATION**

Course Title: ESP II.

Code: LH 132.

Hours: Lecture – 3 Hrs. Credit – 2.

Prerequisite: LH 131 - ESP I

**GRADING**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

**TEXT BOOKS**


**REFERENCE BOOKS**

References available in AAST Library.

**COURSE AIM**

The course aims at enabling learners to decode technical discourse in English with ease and precision. The course is also designed to enhance the learners’ oral production and academic writing.

**COURSE OBJECTIVES**

By the end of the course, learners will be able to:

- Use a variety of listening and reading strategies appropriately.
- Communicate about numerous technical topics orally.
- Use basic computer terms and relevant general vocabulary meaningfully and accurately.
- Apply word-formation rules of prefixation, suffixation and compounding.
- Employ a variety of relevant grammatical structures.
- Write academic essays and employment correspondence.
COURSE OUTLINE

Week Number 1: Orientation + Unit 9 (Computers in Education).

Week Number 2: Unit 9 (Computers in Education).

Week Number 3: Paragraph writing (Concrete Support).

Week Number 4: Unit 10 (Computers in Medicine).

Week Number 5: Unit 10 (Computers in Medicine) + Essay writing (Analysis).

Week Number 6: Essay writing (Application) + Graded workshop.

Week Number 7: Unit 11 (Robotics) + Progress test I.

Week Number 8: Unit 11 (Robotics) + Summary writing.

Week Number 9: Unit 12 (Virtual Reality).

Week Number 10: Unit 12 (Virtual Reality) + Unit 13 (Machine Translation).

Week Number 11: Unit 13 (Machine Translation) + Graded workshop.

Week Number 12: CVs & letters of application + Progress test II.

Week Number 13: Interviewing skills.

Week Number 14: Unit 14 (Multimedia).

Week Number 15: Unit 14 (Multimedia) + General revision.

Week Number 16: Final Exam.
**LH 231 – ESP III**

**Course Information**

Course Title: ESP III.

Code: LH 231.

Hours: Lecture – 3 Hrs. Credit – 3.

Prerequisite: None.

**Grading**

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

**Text Books**


**Reference Books**


**Course Aim**

The course aims at enhancing learners’ writing skills in order to write various types of technical reports following international standards. The course also includes a component on oral presentations of reports.

**Course Objectives**

By the end of the course, learners will be able to:

- Identify the different types of technical reports as well as their structure.
- Write effective background reports.
- Recognize the difference between instructional manuals and process description reports.
- Write effective primary research (lab) and feasibility reports.
Recognize the different sections of a report and how to write each.
Use a dictionary to know the different meanings of a word / phrase / expression and to differentiate between synonyms.
Summarize relevant texts.
Paraphrase relevant texts.
Include in-text citations in writing when necessary.
Document report sources.
Give oral presentations.

COURSE OUTLINE

Week Number 1: Orientation + Overview of technical report writing.
Week Number 2: Background reports.
Week Number 3: Process reports + Instructions and manuals.
Week Number 4: Primary research reports.
Week Number 5: Feasibility reports.
Week Number 6: Report format + Dictionary skills.
Week Number 7: Paraphrasing + Progress test I.
Week Number 8: Summarizing + Further practice on summarizing and paraphrasing.
Week Number 9: Discussion of report outlines + Presentation skills (CD viewing I).
Week Number 10: Quotations and source documentation + Report writing workshop.
Week Number 11: Use of visual aids in technical writing + Presentation skills (CD viewing II).
Week Number 12: Report writing workshop + Progress test II.
Week Number 13: Mini presentations + Report writing workshop.
Week Number 14: Rehearsals.
Week Number 15: End-of-term presentations.
Week Number 16: Final exam.
Mechanical Engineering Courses – ME

ME151 - Engineering Drawings & Projection

COURSE INFORMATION:

Course Title: Engineering Drawings & Projection
Code: ME 151
Hours: Lecture – 2Hrs  Tutorial – 2Hrs  Credit – 2
Prerequisites: None

GRADING:

Class Performance / Attendance  10%
Midterm # 1/ Assignments : (7th week)  30%
Midterm # 2/ Assignments : (12th week)  20%
Final Exam  40%

COURSE DESCRIPTION:


TEXT BOOKS:

Engineering Drawing Book prepared and edited from several related books.

REFERENCE BOOKS:


COURSE AIM:

To give the student the ability to communicate by means of engineering drawing and to relate the applications of drawing techniques to mechanical engineering practice.
COURSE OBJECTIVES:

To provide the basic information for engineering drawing and to present the different types of drawings in generic and basic forms with enough depth.

COURSE OUTLINE:

Week Number 1: Drawing practices and techniques (Exercises on geometrical construction)
Week Number 2: Methods of object projection (Exercises on geometrical construction – Exercises on object projection)
Week Number 3: Orthogonal projection (Exercises on orthogonal projection)
Week Number 4: Missing views, dimensioning and free hand sketching (Exercises on projection and free hand sketching)
Week Number 5: Sectioning and conventions (Exercises on sectional views)
Week Number 6: Intersection of geometrical surfaces and development (Exercises in intersection of geometrical surfaces and development)
Week Number 7: Standard metal sections and metal structures (Exercises on metal structures) - Quiz
Week Number 8: Compound metal sections and welds (Exercises on metal structures)
Week Number 9: Isometric projection (Exercises on Isometric)
Week Number 10: Isometric projection & Surface intersections (Exercises on Isometric and surface intersections)
Week Number 11: Perspective projection (Exercises on Perspective projection)
Week Number 12: Perspective projection (Cont.) (Exercises on interior and exterior perspective projection) – Quiz
Week Number 13: Computer Aided drafting using AutoCAD (General Introduction)
Week Number 14: Drawing and editing commands in AutoCAD
Week Number 15: Writing texts, Dimensioning and viewing commands
Week Number 16: Final Exam.
Non Engineering Courses – NE

NE 264 – Scientific Thinking

COURSE INFORMATION

Course Title: Scientific Thinking.
Code: NE 264.
Hours: Lecture – 4 Hrs. Credit – 3.
Prerequisite: None.

GRADING

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

COURSE DESCRIPTION


TEXT BOOKS

Abdel-Moneim Hassan, Scientific Thinking

REFERENCE BOOKS

References available in the Academy library.

COURSE AIM

The main goal of the course is to develop the thinking skills of engineering and technology students.
COURSE OBJECTIVES

The objectives of the course is to have students learn to define science use reasoning skills such as, analysis, synthesis, including, deducing, increasing, apply the methods science to solve problems, use creative thinking skills in real situations.

COURSE OUTLINE

Week Number 1: Thinking Patterns Development.

Week Number 2: Meaning & Construction of Science; Scientific Values & Directions.

Week Number 3: Science, non-science & other-than science. Engineering & Technology.

Week Number 4: Properties of science & the thinking processes.

Week Number 5: Objectives of science & postulates of scientific thinking.

Week Number 6: Mental operations used in science, scientific guessing methods of reasoning in mathematics.

Week Number 7: Types of deductions & the 7th week exam.

Week Number 8: Methods of reasoning in Natural sciences.

Week Number 9: Research methods in natural sciences.

Week Number 10: Experiments & Observations; Scientific postulates & their conditions Creative thinking.

Week Number 11: Verification of scientific postulates.

Week Number 12: Flexibility & originality.

Week Number 13: Creative thinking, fluency types.

Week Number 14: Basics of brainstorming; methods of decision making.

Week Number 15: General Revision.

Week Number 16: Final exam.
NE 465 – Aesthetic Education and Art Appreciation

Course Title: Aesthetic Education and Art Appreciation.
Code: NE 465.
Hours: Lecture – 4 Hrs. Credit – 3.
Prerequisite: None.

Grading

- Class Performance/Attendance: 10%
- Midterm # 1/Assignments – (7th Week): 30%
- Midterm # 2/Assignments – (12th Week): 20%
- Final Exam: 40%

Course Description

Aesthetic training and appreciation on a wide range of types of arts, including Music, Drawing, Painting, Sculpture and Engraving; Applied art (major and minor arts); The Ancient world, Classical world and Christian world (Christianity); Islamic and oriental arts; Medieval Western world; Renaissance in the 17th, 18th and 19th Centuries; Modern arts in the 20th Century.

Text Books

Naema El-Shishiny, Aesthetic education & Art appreciation (Arabic and English).

Reference Books

- Largesse Encyclopedia of Modern Art (1800 to present).
- A course history of arts (Herbert Read).
- The McMillan encyclopedia of Art.

Course Aim

A work of art produces an agreeable impression as processing aesthetic beauty which is the result of the satisfaction of the mind and the stimulation of our senses.

Course Objectives

Student to be acquainted with different forms of arts (fine arts and applied arts) their techniques and main elements. An output over the ages of man’s creativity, thus the appreciation of art’s essence and permanent values.
COURSE OUTLINE

Week Number 1: Introduction to Aesthetic Education.
Week Number 2: Drawing.
Week Number 3: Painting.
Week Number 4: Sculpture.
Week Number 5: Engraving.
Week Number 6: Applied Art; Introduction to art appreciation.
Week Number 7: The Ancient world & 7th week exam.
Week Number 8: The ancient world.
Week Number 9: Classical world (Christianity).
Week Number 10: Christian work;
Week Number 11: Islamic & oriental arts.
Week Number 12: Medieval world.
Week Number 13: Renaissance + 17th C.
Week Number 14: 18th C + 19th C.
Week Number 15: 20th C + modern arts.
Week Number 16: Final Exam.
NE 465 – Aesthetic Education and Art Appreciation

COURSE INFORMATION

Course Title: Aesthetic Education and Art Appreciation.

Code: NE 465.

Hours: Lecture – 4 Hrs. Credit – 3.

Prerequisite: None.

GRADING

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

COURSE DESCRIPTION

Aesthetic training and appreciation on a wide range of types of arts, including Music, Drawing, Painting, Sculpture and Engraving; Applied art (major and minor arts); The Ancient world, Classical world and Christian world (Christianity); Islamic and oriental arts; Medieval Western world; Renaissance in the 17th, 18th and 19th Centuries; Modern arts in the 20th Century.

TEXT BOOKS

Naema El-Shishiny, Aesthetic education & Art appreciation (Arabic and English).

REFERENCE BOOKS

- Largesse Encyclopedia of Modern Art (1800 to present).
- A course history of arts (Herbert Read).
- The McMillan encyclopedia of Art.

COURSE AIM

A work of art produces an agreeable impression as processing aesthetic beauty which is the result of the satisfaction of the mind and the stimulation of our senses.

COURSE OBJECTIVES

Student to be acquainted with different forms of arts (fine arts and applied arts) their techniques and main elements. An output over the ages of man’s creativity, thus the appreciation of art’s essence and permanent values.
COURSE OUTLINE

Week Number 1: Introduction to Aesthetic Education.

Week Number 2: Drawing.

Week Number 3: Painting.

Week Number 4: Sculpture.

Week Number 5: Engraving.

Week Number 6: Applied Art; Introduction to art appreciation.

Week Number 7: The Ancient world & 7th week exam.

Week Number 8: The ancient world.

Week Number 9: Classical world (Christianity).

Week Number 10: Christian work;

Week Number 11: Islamic & oriental arts.

Week Number 12: Medieval world.

Week Number 13: Renaissance + 17th C.

Week Number 14: 18th C + 19th C.

Week Number 15: 20th C + modern arts.

Week Number 16: Final Exam.
NE 364 – Engineering Economy

**COURSE INFORMATION**

Course Title: Engineering Economy.
Code: NE 364.
Hours: Lecture – 2 Hrs. Tutorial – 2 Hrs. Credit – 3
Prerequisite: None.

**GRADING**

Class Performance/Attendance: 10%
Midterm # 1/Assignments – (7th Week): 30%
Midterm # 2/Assignments – (12th Week): 20%
Final Exam: 40%

**COURSE DESCRIPTION**

A study of basic concepts emphasizing analysis of aggregate economy. Examination of the processes of price determination and calculation of optimum demand for maximum profit. Basic principles of money-time relationship. Methods of investment assessment and fundamental techniques of comparison of investment opportunities. Theories of depreciation of physical facilities and study of cost recovery systems.

**TEXT BOOKS**


**REFERENCE BOOKS**


**COURSE OBJECTIVES**

- Introduction basic cost concepts and economic environment.
- Familiarization of the principles of money time relations and basics of investments opportunities assessment and evaluation.

**COURSE OUTLINE**

*Week Number 1:* Introduction and overview.
*Week Number 2:* Cost concepts and the economic environment.
Week Number 3:  Principles of money – time relations, the concept of economic equivalence.

Week Number 4:  Cash flow diagrams: Interest formulas and uniform series.

Week Number 5:  Cash flow diagrams: Uniform gradient series and geometric sequence.

Week Number 6:  Nominal and effective interest rates, continuous compounding and continuous cash flows.

Week Number 7:  Exam # 1.

Week Number 8:  Applications of engineering economy: Methods of investment assessment.

Week Number 9:  Comparing alternatives: Useful life is equal to the study period.

Week Number 10: Comparing alternatives: Useful life is shorter than the study period.

Week Number 11: Comparing alternatives: Useful life is longer than the study period.

Week Number 12:  Exam # 2.

Week Number 13:  The imputed market value technique.

Week Number 14:  Depreciation: Historical Methods.

Week Number 15:  Depreciation: Cost recovery systems.

Week Number 16:  Final Exam.
Teaching Faculty List

A list of teaching faculty staff includes: names, position, date, university, specialization, experience in industry, research activities.

Full Time Staff

AMR MAGED RAGHEB EL-HELW

Ph.D, 2008, Staffordshire University

Specialization
Digital signal processing, computer vision, pattern recognition, communication

DARWISH ABD EL AZIZ MOHAMED

Ph.D in Electrical Engineering – April 1988 – Military Technical College

Specialization
Electromagnetic and Antenna Wave Propagation

Research Activities

- Preparation of notes for electronic courses such as electronic devices and semiconductor devices
- Translation of military related books such as modern Radars
- Development of specialized and militarily based curricula
- Development of engineering curriculum at Air Defense College
- Organizing committee, URSI conference, Alexandria University, 1995
- Supervision of undergraduate projects, master and PhD theses
- Participation in the design of wideband wire antennas for the Naval Postgraduate School, CA, USA
- Technical committee of National Radio Science Conferences (NRSC)
- Chief of research team in military applied research in Radars
- Chief of research team in military applied research in command and control systems
- Chief of research team in military applied research in training and simulation systems
- Chief of research team in military applied research in guidance systems.

Ph.D. in Electrical Engineering with a minor in Mathematics, GPA: 4.00, May 2002, Louisiana State University-Baton Rouge- USA

Specialization
Communications and Signal Processing

Research Activities
- Image processing
- MIMO systems for wireless communication
- MIMO channel equalization and estimation
- Digital communications


Specialization
Systems Design Engineering

Research Activities
Image/Video processing & analysis, pattern recognition, Communications Engineering.


Ph.D Electronics and Communication, Faculty of Engineering – 2002 – Alexandria University

Specialization
Electronics: (Measurements – Artificial Intelligent Techniques – Solar cell systems – Data Acquisition System)


Specialization
Electronics and Communication

Research Activities
Biometrics, Image processing, pattern recognition, watermarking, and image compression.

M. O. H. A. B. A.  M. A. N. G. O. U. D.

Ph. D in Electrical Engineering – July 2001 –University of Bradford, UK

Specialization
Wireless Communications
Experience in Industry
1 Year – Commercial Satellite industry, UK EADS -Astrium limited (formally Matra Marconi Space Ltd)

MOHAMED ESSAM KHEDR

PhD, University of Ottawa, December 2004

Specialization
Wireless Communications and Networking

Research Activities
Wireless Communications, Mobile networking, Digital Communications, Multimedia networking

MOHAMED HASSAN AL SHARKAWY

Ph. D., December 2006 at the University of Mississippi/ USA

Specialization
Computational Electromagnetics

Experience in Industry
Designing antennas and antenna arrays for different projects.

Research Activities
Antennas and Scatterers, Antenna analysis and design for wideband applications and wireless communication, Antenna array design suitable for breast cancer detection, Electromagnetic scattering from dielectric, chiral, and Meta-materials and their applications, Tumor detection based on scattered field together with image processing, Numerical Methods in Electromagnetics, Finite Difference Time Domain Technique, Finite Difference Frequency Domain Technique, Method of Moments, Microwave Engineering, Filter analysis and design, and MEMS design.

MOHAMED MAHMOUD MOHAMED OMAR


Specialization
Communications

Research Activities
Smart Antennas, Microstrip Antennas, Coding and Signal Processing

MOUSTAFA HUSSEIN ALY


Specialization
Optical Communications.

Research Activities
Optical Fibers, Optical Amplifiers and Optical Networks.
B. Sc. Program Status Report 2009

Roshdy Abdel Rasool

Ph.D in Information Technology - 1987, Alexandria University, Alexandria, Egypt

Specialization
Electrical, Electronic, Communication, and Computer Engineering.

Sharaf El-Din El-Nahas

D. Sc., 1984, Washington University

Specialization
Electronics and Communications

Experience in Industry
Telecommunications and Consumer Electronics

Research Activities
Biomedical systems and Information coding

Part Time Staff

Farouk Abdallah Salem

Rostock University, Germany, May 97

Specialization
Application of SST for improving Radar target identification in the intelligent systems

Experience in Industry
• Communications, Navigation, electric systems of the Navy submarine
• Consultant engineer in design the Industrial comm., elect, nets.

Research Activities
Smart comm. Systems and net.

Hossam Salah El-Deen Gaweesh

Ph.D. University of Alexandria, 1964

Specialization
Electrical Engineering

Experience in Industry
Production Engineer in Alexandria shipyard

Khamies El-Shennawy

Alexandria Univ. April, 1987, Ph.D.
Specialization
Communications

Experience in Industry
Ford Aerospace, Beker, Siemens companies, and Egyptian naval force

NADDER HAMDY

Ph. D., University of Erlangen, 1979

Specialization
Electronic circuits - signal processing

Research Activities
Image watermarking, compression, enhancement, A/D converters

NESSHEM MORKOS

Ph. D. University of Wales, UK, 1978

Specialization
Satellite Dlobal Positioning

Experience in Industry
Repair of Electronic Equipment on broad ship (Radar & Echo sounder)

Research Activities
Satellite Position Fixing
Assistants

AHMED ABD EL AZIZ YOUSSEF SHALABY

M.Sc. in Electronics and Communications Engineering – September 2006 – A.A.S.T

Specialization
Optical communications

AHMED ABBAS KHOURSHED ABD-ELAZIZ

B.Sc in Electronics and Communication Engineering – August 2008 – A.A.S.T

Specialization
Electronics

Research Activities
VLSI Fabrication

AHMED FATHI AL-KABBANY


Specialization
Electronics and Communications Engineering

Research Activities

AMIRA ZAKI

M.Sc in Electronics and Communication Engineering – June 2004 – A.A.S.T

Specialization
Electromagnetic – Antenna and Wave Propagation

AMMAR MOTTIE MAHMOUD ALHOSAINY


Specialization
Electronics and Communication

Research Activities
Digital Signal processing, VLSI Design, and Microcontrollers

AMR EL-SAYED MAHMOUD RIZK

B.Sc in Electronics and Communication Engineering – August 2008 – A.A.S.T
Specialization
Microelectronics

Research Activities
Radio-Frequency Integrated Circuit, Network on Chip

HASAN SHOKRY MOHAMAD EL-DIB

B.Sc in Electronics and Communication Engineering – August 2006 – A.A.S.T

Specialization
Electronics and Communication

Research Activities
Digital Signal processing, VLSI Design, and FPGA

HATEM MOHAMMAD RAAFAT ABU-ZEID

M.Sc in Electronics and Communications Engineering – October 2008 – A.A.S.T

Specialization
Electronics and Communications Engineering.

HAZEM SARWAT SHATILA

M.Sc. in Electronics and Communications Engineering – September 2003 – A.A.S.T

Specialization
Digital Signal and Image processing, Digital communication systems, Biomedical Engineering, wireless communication, Mobile Communication.

Experience in Industry
5 Years experience in Vodafone Egypt

Research Activities
Wireless Communication - Cognitive Radio for WiMAX Systems

HEBA AHMED FAYED MOHAMED

M.Sc. in Electronics and Communications Engineering – December 2004 – A.A.S.T

Specialization
Optical Communications.

HEBA SHABAN

M.Sc in Electronics & Communications Engineering – April 2003 – A.A.S.T

Specialization
Communications Engineering
Research Activities

- Public Key Data Encryption (M.Sc)
- Wireless Communications (Ph. D)

IMAN GALAL MAHMoud IBRAHIM

B.Sc in Electronics and Communication Engineering – August 2008 – A.A.S.T

Specialization
Electronics and Communication

Research Activities
Antenna and propagation

ISLAM ABDELLATIF MOHAMED

B.Sc in Electronics and Communication Engineering – August 2009 – A.A.S.T

Specialization
Microelectronics Circuit Design

Research Activities
Analog IC Design

KHALED HASSAN MOHAMED ATTIA ELZAAFRANY

B.Sc in Electronics and Communication Engineering – August 2008 – A.A.S.T

Specialization
Electronics and Communication

Research Activities
Electronics

MAHA AHMAD ABD ALBARY ALHESSI


Specialization
Optical Communications

MOHAMMED ALI AHMAD BEDIER

B.Sc in Electronics and Communication Engineering – August 2008 – A.A.S.T

Specialization
Electronics and Communication

Research Activities
Communication
Mohamed Essam Hassan Tamezin

M.Sc in Electronics and Communication Engineering – Nov. 2008 – A.A.S.T

Specialization
Electronics and Communication

Research Activities
Wireless Optical Communications.

Mohamed Essam Moussa

B.Sc in Electronics and Communication Engineering – August 2006 – A.A.S.T

Specialization
Wireless Communication and Networks

Research Activities
WLAN, and QoS

Mohamed Hossam Afifi

B.Sc in Electronics and Communication Engineering – August 2009 – A.A.S.T

Specialization
Wireless Communication and Networks

Research Activities
Mobile Communications, WiMAX, and VoIP

Mohamed Ibrahim Mohamed Mohamed

M.Sc in Electronics and Communication Engineering – February 2009 – A.A.S.T

Specialization
Electronics and Communication

Research Activities
Optical Communications.

Mohamed Salem Hefaida

M.Sc in Electronics & Communications Engineering – September 2006 – A.A.S.T

Specialization
Optical Communications – Communication Systems

Monasabry Abdalla

M.Sc. in Electronics and Communications Engineering – April 2003 – A.A.S.T
Specialization
Antenna Arrays Optimization Using Genetic Algorithm

MOSTAFA EL-SAYED MOHAMED ABD EL ALEEM


Specialization
Mobile wireless communications, Bluetooth, UWB radio technology

NOUR EL DIN HASSAN EL MADANY

B.Sc in Electronics and Communication Engineering – August 2008 – A.A.S.T

Specialization
Wireless Communications

Research Activities
Cognitive Radio, Channel Problems, and MIMO

OMNEYA AMR ATTALLAH

M.Sc in Electronics and Communication Engineering – February 2009 – A.A.S.T

Specialization
Electronics and Communication

Research Activities
Medical image watermarking.

RADWA KHALIL KHALIL IBRAHIM HAMAD

M.Sc in Electronics and Communication Engineering – March 2007 – A.A.S.T

Specialization
Electromagnetic - Wave propagation & Antennas

SALMA DARWISH ABD EL-AZIZ MOHAMED

B.Sc in Electronics and Communication Engineering – August 2008 – A.A.S.T

Specialization
Electronics and Communication

Research Activities
Communication

SARA IBRAHIM ABD EL-MONIEUM MORSY

B.Sc in Electronics and Communication Engineering – August 2008 – A.A.S.T
Specialization
Electronics and Communication

Research Activities
Measurements

SHAIMAA ABDALLAH MOHAMED

M.Sc. in Electronics and Communications Engineering – September 2002 – A.A.S.T

Specialization
- Electronic Devices, Solid State, Optoelectronic, Photonic Devices,
- Image Sensors, VLSI applications, and Systems on Chip applications.

SHAIMAA MOHAMED FARGHY SAYED

B.Sc in Electronics and Communication Engineering – August 2008 – A.A.S.T

Specialization
Electronics and Communication

Research Activities
Antenna and propagation

TAMER FAROUK MOHAMMAD FARID BADRAN

M.Sc in Electronics and Communication Engineering – July 2009 – Assiut Univ

Specialization
Electronics

Research Activities

WAEL ABD ELLATIF ALI MOHAMED


Specialization
Speech Coding-Compression Techniques-Mobile Antennas

WESAM MOHAMED GAMAL EL-DIN ABD EL LATIF

M.Sc in Electronics and Communication Engineering – March 2007 – A.A.S.T

Specialization
Image compression

Research Activities
Medical imaging. Image compression. Assisting lecturers with undergraduate projects.
Department Facilities

Description of the department facilities including laboratories, workshops, computing and information facilities, and the courses supported by these facilities.

Experimental Facilities Supporting the Program

The program utilizes a number of well-equipped laboratories for instructions and research. Hands-on experience is highly emphasized throughout the program and ultra modern equipment is to serve the interests of both the students and staff.

List of Laboratories utilized through the five academic years.

- Solid State Electronics Lab
- Electronic Circuits Lab.
- Electronic Devices Lab
- Gmdss - Vlsi Lab
- Digital Communication Lab
- Analog Communication Lab
- Fiber Optics and Acoustics Lab.
- Marine Radar Lab
- Antenna And Microwave Lab
- Electrical Circuits Lab.
- Microprocessor Lab
- Digital Circuits Lab
- Digital Automatic Control Laboratory
- Analogue Automatic Control Laboratory
- Computer Laboratory
- Physics Laboratory I
- Physics Laboratory II
- Chemistry Laboratory
Solid State Electronics Lab

LABORATORY INFORMATION

Room No.: 038
Capacity: 21 students

MAJOR EQUIPMENT

- 3 Micro-voltmeters.
- 1 Wattmeter.
- XY-YI Recorder.
- 1 Transformer.
- 2 Halogen Lamp.
- 5 Rheostats.
- 3 Solar Cell Battery
- 2 He NE Laser.
- 4 Analog Multi-meters.
- 5 Digital Multi-meters.
- 2 Tesla Meter.
- 2 ESR Control Unit.
- 2 Oscilloscopes.
- Low Testing set Transformer.
- 2 Hall Effect Apparatus (Silver and Tungsten).
- 1 Stabilized PSU.
- 3 Thermocouples.
- High Current Power supply.
- A.C- D.C Power supply.
- 0-15 v Laboratory Power supply.

THE LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 210</td>
<td>Solid State Electronics</td>
<td>3</td>
</tr>
<tr>
<td>EC 211</td>
<td>Solid State Electronics</td>
<td>3</td>
</tr>
</tbody>
</table>
Electronic Circuits Lab

LABORATORY INFORMATION

Room No.: 232

Capacity: 25

LABORATORY EQUIPMENT

- 4 Digital Oscilloscope.
- 2 Analog Oscilloscopes
- 5 Frequency counter
- 7 power Supply.
- 11 Function Generators.
- 8 Digital Multi-meters.
- 5 Analog Multi-meters.

THE LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 333</td>
<td>Electronic Amplifiers</td>
<td>6th</td>
</tr>
<tr>
<td>EC 134</td>
<td>Fundamentals of electricity &amp; electronics</td>
<td>2nd</td>
</tr>
</tbody>
</table>
Electronic Devices Lab

**LABORATORY INFORMATION**

Room No.: 230  
Capacity: 25

**LABORATORY EQUIPMENT**

- 5 All-in-One equipment (Multi-meter, function generator, DC power supply, and frequency meter)  
- 8 Power supply  
- 6 Function generator  
- 2 Slide projector  
- 4 Analog oscilloscope

**THE LABORATORY SERVES THE FOLLOWING COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 134</td>
<td>Fundamentals of Electricity &amp; Electronics</td>
<td>2nd</td>
</tr>
<tr>
<td>EC 332</td>
<td>Electronic Devices II</td>
<td>5th</td>
</tr>
<tr>
<td>EC 333</td>
<td>Electronic Amplifiers</td>
<td>6th</td>
</tr>
<tr>
<td>EC 342</td>
<td>Microelectronic circuits</td>
<td>7th</td>
</tr>
<tr>
<td>EC 434</td>
<td>Analog Signal Processing</td>
<td>8th</td>
</tr>
</tbody>
</table>
Gmdss - Vlsi Lab

LABORATORY INFORMATION

Room No. : 430
Capacity: 25

LABORATORY EQUIPMENT

- 21 PC Core 2 duo, 2GB RAM, 260 GB HD.

THE LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 544</td>
<td>Antenna Engineering</td>
<td>9th</td>
</tr>
<tr>
<td>EC 535</td>
<td>Digital VLSI Design</td>
<td>9th</td>
</tr>
<tr>
<td>EC 536</td>
<td>VLSI Fabrication &amp; Testing</td>
<td>10th</td>
</tr>
<tr>
<td>EC 501</td>
<td>Project 1</td>
<td>9th</td>
</tr>
<tr>
<td>EC 503</td>
<td>Project 2</td>
<td>10th</td>
</tr>
<tr>
<td>EC 533</td>
<td>Digital Signal Processing</td>
<td>10th</td>
</tr>
</tbody>
</table>
Digital Communication Lab

LABORATORY INFORMATION

Room No. : 132
Capacity: 25

MAJOR EQUIPMENT

- 4 Power Supplies.
- Signal Analyzer.
- Spectrum Analyzer.
- Function Generators.
- 2 Analog Oscilloscopes, 1 Digital Oscilloscope.
- Signal generator.
- D.C Power Supply.
- 2 PSG 1000 Synthesized Signal Generator.
- Multi-meter Function Generator.
- 8111A Pulse/Function Generator.
- 3 Function Arbitrary 33120A Wave Generator.
- ISO-Tech IDM 205 RMS
- 4 Oscilloscopes Multiplexer.
- 2 DAE SHIN DOA-141 all in one.
- Lab-Volt Digital Training Kit.
- 2 Frequency Counter.
- Oscilloscope 20 MHz SN9205, HP Oscilloscope 150 MHz.
- 2 H-CAL-ECS-C Electronic Communication systems.
- Hampden Hbt 460 Digital multi-meter.
- RF generator.
- 2 Personal Computer

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 217</td>
<td>Measurements &amp; Instrumentation</td>
<td>4th</td>
</tr>
<tr>
<td>EC 218</td>
<td>Measurements &amp; Instrumentation</td>
<td>4th</td>
</tr>
<tr>
<td>EC422</td>
<td>Introduction to Digital Communications</td>
<td>8th</td>
</tr>
<tr>
<td>EC523</td>
<td>Signal Space and Applications</td>
<td>9th</td>
</tr>
</tbody>
</table>
Analog Communication Lab

LABORATORY INFORMATION

Room No.: 130
Capacity: 25

MAJOR EQUIPMENT

- Power Supply
- Signal Analyzer.
- Spectrum Analyzer.
- 4 Pulse Function Generators.
- 1 Analog Oscilloscope.
- 1 Digital Oscilloscope.
- Signal generator.
- D.C Power Supply.
- Multi-meter Function Generator.
- 2 Function Arbitrary 33120A Wave Generator.
- 2 Frequency Counter.

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 321</td>
<td>Spectral Analysis</td>
<td>5th</td>
</tr>
<tr>
<td>EC 322</td>
<td>Continuous Wave Modulation</td>
<td>6th</td>
</tr>
<tr>
<td>EC 421</td>
<td>Random Signals and Noise</td>
<td>7th</td>
</tr>
<tr>
<td>EC 501</td>
<td>Project 1</td>
<td>9th</td>
</tr>
<tr>
<td>EC 503</td>
<td>Project 2</td>
<td>10th</td>
</tr>
</tbody>
</table>
Fiber Optics and Acoustics Lab

LABORATORY INFORMATION

Room No. : 140
Capacity: 16

MAJOR EQUIPMENT

- Newport Fiber Optics Training Kit
- Bruel & Kjaer Acoustics Training Kit
- Laser Power meter
- Newport Optical bench
- PC - P4 processor RAM 128 MB HD 80 GB
- Module DL 55M63 Delorenzo
- Fiber Optics Network.
- Telecommunication Network Cabling Trainer.

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 539</td>
<td>Opto-Electronics</td>
<td>9th</td>
</tr>
<tr>
<td>EC 524</td>
<td>Optical communications</td>
<td>10th</td>
</tr>
<tr>
<td>EC 522</td>
<td>Acoustics</td>
<td>10th</td>
</tr>
<tr>
<td>EC 501</td>
<td>Project 1</td>
<td>9th</td>
</tr>
<tr>
<td>EC 503</td>
<td>Project 2</td>
<td>10th</td>
</tr>
</tbody>
</table>
Marine Radar Lab

LABORATORY INFORMATION

Room No. : 428
Capacity : 20

MAJOR EQUIPMENT

- Marine Radar.
- Target Positioning System
- Clutter Generator.
- Tue RMS Voltmeter / Power meter.
- Radar Transmitter.
- Radar Receiver.
- Radar Synchronizer.
- 2 Power Supply.
- Target Controller.
- Analog NTI Processor
- PPI SCAH Converter.
- Dual Channel Sampler.
- Antenna Motor Driver.
- Rotating Antenna.
- 2 Oscilloscopes.
- TV Trainer Strain.
- HP Laser Printer.
- Electronics Telephone system trainer.
- Installer Toolkit.
- Mobile Frame.
- Telephone product Analyzer.

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 532</td>
<td>Media And Entertainment Engineering</td>
<td>9th</td>
</tr>
<tr>
<td>EC 527</td>
<td>Applied Tele-Communications</td>
<td>10th</td>
</tr>
</tbody>
</table>
Antenna and Microwave Lab

LABORATORY INFORMATION

Room No. : 426
Capacity : 18

MAJOR EQUIPMENT

- Antenna System Demonstrator.
- RF Generator.
- 2 Oscilloscopes.
- Transmission Line Demonstrator.
- Function Generator.
- Antenna Test Bench.
- 4 Power Supply.
- 2 VSWR Indicators.
- Antenna Modelling System.
- 5 1.7 GHz P4 256 MB RAM 60 GB HD.
- 3 P3 800 MHz 128 RAM 40 GB HD.
- Variable Attenuator.
- Microwave Test Bench.
- 2 NEC computers

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 442</td>
<td>Electromagnetic wave propagation</td>
<td>7th</td>
</tr>
<tr>
<td>EC 443</td>
<td>Electromagnetic Transmitting Media</td>
<td>8th</td>
</tr>
<tr>
<td>EC 544</td>
<td>Antenna Engineering</td>
<td>9th</td>
</tr>
<tr>
<td>EC 545</td>
<td>Mobile Antennas</td>
<td>10th</td>
</tr>
<tr>
<td>EC 501</td>
<td>Project 1</td>
<td>9th</td>
</tr>
<tr>
<td>EC 503</td>
<td>Project 2</td>
<td>10th</td>
</tr>
</tbody>
</table>
Electrical Circuits Lab

LABORATORY INFORMATION

Room No.: 034
Capacity: 25

MAJOR EQUIPMENT

- Spectrum Analyzers.
- Digital Oscilloscopes.
- Analog Oscilloscopes.
- Multiplexer.
- Digital power Supply.
- Analog power Supply.
- Function Generator.
- Digital LCR Meter.
- Digital Multi-meter.
- Analog Multi-meter.
- Test Boards.

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 231</td>
<td>Electrical Circuit 1</td>
<td>3rd</td>
</tr>
<tr>
<td>EE 232</td>
<td>Electrical Circuit 2</td>
<td>2nd</td>
</tr>
</tbody>
</table>
Microprocessor Laboratory

LABORATORY INFORMATION

The laboratory gives the students the opportunity to use the microprocessors kit for running several programs written in assembly language and it provides various tests and runs numerous experiments, also, it help the students to establish interfacing between computer and different input/output devices, Finally, it supports the students with all materials required to create different micro-controller chips.

Room no.: College Engineering & Technology - 326
Capacity: 25 students

LABORATORY EQUIPMENT

- Computer Intel P. V core 2 Duo, RAM 1 GB, HD 160GB, DVD writer.
- Microcomputer Teaching System
- Portable Programmer
- Microprocessor Application Board
- Microprocessor Training System
- CPLD Card XC 9500 Complex Programmable Logic Device
- FPGA (Field Programmable Gate Array) Development Boards
- Spartan-3A DSP 1800A Development Board with embedded MicroBlaze Softcore.
- Spartan-3 Starter Kit with XC3S200 FPGA chip and 512KB SRAM.
- Data Acquisition Experiments.
- Running assembly programs on 8088/86 Microprocessors boards.

THE LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC 341</td>
<td>Digital Electronics</td>
<td>6</td>
</tr>
<tr>
<td>CC 411</td>
<td>Introduction to Microprocessor</td>
<td>7</td>
</tr>
<tr>
<td>CC 415</td>
<td>Data Acquisition Systems</td>
<td>8</td>
</tr>
<tr>
<td>CC 421</td>
<td>Introduction to Microprocessor</td>
<td>7</td>
</tr>
<tr>
<td>CC 514</td>
<td>Intelligent Robotics</td>
<td></td>
</tr>
<tr>
<td>CC 521</td>
<td>Microcomputer Based Design</td>
<td></td>
</tr>
<tr>
<td>CC 527</td>
<td>Computer Aided Design</td>
<td></td>
</tr>
</tbody>
</table>
Digital Circuits Laboratory

LABORATORY INFORMATION

A completely equipped laboratory that contains precision measurement equipments and tools for use in digital logical experiments. The laboratory houses a collection of equipment used for the generating signals and visualizing it.

Room no.: College Engineering & Technology - 441
Capacity: 25 students

LABORATORY EQUIPMENT

- Programmable Logic FX12 (XV4VFX12)
- Xilinx University Program Development System XUPV2P with Virtex 2 pro XC2VP30 and two embedded hardcore PowerPC 405 processors.
- Programmable Logic Digilent D2FT.
- Accessory Board Memory.
- Accessory Board Network (NET1)
- Accessory Board Digilent Analog I/O (ALO).
- Logic Pulser.
- Oscilloscope.
- Function Generator.

THE LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC 216</td>
<td>Digital Logic</td>
<td>4</td>
</tr>
</tbody>
</table>
Digital Automatic Control Laboratory

LABORATORY INFORMATION

Room No. : 101
Capacity : 20

MAJOR EQUIPMENT

- Programmable Logic Controller “OMRON”
- Programmable Logic Controller “SIEMENS S5-115U”
- Programmable Logic Controller Trainer.
- Lab-Volt 32 Bit Microprocessor Trainer
- Heat Kd-ETW 3800 Microprocessor Trainer.
- DC Motor Control Simulator.
- Rotary Transfer Unit Simulator.
- Traffic Control Simulator.
- Washing Machine Simulator.
- Mentor Robot Arm.
- Digital Multimeter.

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 418</td>
<td>Automatic Control Systems</td>
<td>7th</td>
</tr>
<tr>
<td>EE 419</td>
<td>Modern Control Engineering</td>
<td>8th</td>
</tr>
<tr>
<td>EE 502</td>
<td>Project 2</td>
<td>10th</td>
</tr>
</tbody>
</table>
Analogue Automatic Control Laboratory

**LABORATORY INFORMATION**

- Room No.: 103
- Capacity: 20

**MAJOR EQUIPMENT**

- Speed & Position Control Process.
- Induction Motor 3-pH Speed Control Trainer.
- Process Control Simulator.
- Light Control process Simulator.
- Temperature Process Trainer T-3.
- Level & Flow Trainer LF-1.
- Computer Control Process Trainer.
- Valve Calibration Trainer.
- Analogue training System.
- F.B. Modular Servo System.
- 3 Oscilloscopes.
- 3 Function Generators.
- Frequency Sweeper.
- Dead Weight Tester.
- Programmable logic Controller “Siemens S-5 100U”.
- 3 Digital Multimeters.
- 4 Air Compressors.
- Mini Workshop.

**LABORATORY SERVES THE FOLLOWING COURSES**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 419</td>
<td>Modern Control Engineering</td>
<td>9th</td>
</tr>
<tr>
<td>EE 518</td>
<td>Automated Industrial System 2</td>
<td>10th</td>
</tr>
</tbody>
</table>
Computer Laboratory

LABORATORY INFORMATION

Room No.: 204, 206, 300, 304, 307, 312
Capacity: 25

MAJOR EQUIPMENT

25 Computers.

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course no.</th>
<th>Courses Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC 111</td>
<td>Introduction to Computers</td>
<td>1st</td>
</tr>
<tr>
<td>CC112</td>
<td>Structured Programming</td>
<td>2nd</td>
</tr>
<tr>
<td>CC213</td>
<td>Programming Applications</td>
<td>3rd</td>
</tr>
</tbody>
</table>
Physics Laboratory I

LABORATORY INFORMATION

Lab Name: Physics Lab I
Room No.: 114
Capacity: 25

MAJOR EQUIPMENT

- C.R.O (Oscilloscope)
- D.C power supply
- Function generator
- Lee's apparatus
- Louis peaker
- Beaker glass
- Microphone
- Chemical balance
- Resonance tube
- Aluminum calorimeter
- Sanometer
- Joules apparatus
- Mains transformer (240 V - 6 V)
- Heater
- Searle’s apparatus
- Copper Block
- Thermometers
- Voltmeter Ammeter
- Aluminum calorimeter
- Beaker glass
- Resonance tube
- Mains transformer (240 V - C V)

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course no.</th>
<th>Courses Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA 113</td>
<td>Physics I</td>
<td>2</td>
</tr>
</tbody>
</table>
Physics Laboratory II

LABORATORY INFORMATION

<table>
<thead>
<tr>
<th>Lab Name:</th>
<th>Physics Lab II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room No.:</td>
<td>116</td>
</tr>
<tr>
<td>Capacity:</td>
<td>25</td>
</tr>
</tbody>
</table>

MAJOR EQUIPMENT

- D.C power supply
- Function generators
- Coils 500, 100 turns
- Optical bench
- Voltmeters
- Polarizers
- Ammeters
- Analyzers
- Connecting leads
- Holders
- Bridging plugs
- Selenium photo-electric cell
- Capacitors (electrolyte)
- Meter Bridge
- Dual-beam C.R.O
- Moving coil galvanometer
- PNC-Cables
- Rheostats
- Laser sources
- 1.5 volt battery
- Lenses
- Digital Multi-meter
- Travelling microscope
- Monochromatic tight source (Sodium.) and selenium photo-cell
- E/m apparatus / Variable gap magnet

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course no.</th>
<th>Courses Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA 114</td>
<td>Physics II</td>
<td>2</td>
</tr>
</tbody>
</table>
Chemistry Laboratory

LABORATORY INFORMATION

Lab Name: Chemistry
Room No.: 214,150
Capacity: 25

MAJOR EQUIPMENT

- Chemicals and Reagents
- Pippets, Burettets, Conical Flasks, Beakers, Funnels, Measuring Cylinders, Measuring Flasks.
- Projector
- Spectrophotometers
- PH meter
- Water analysis
- Test Oil Sets
- Sensitive Balances
- Oven
- Distill Water System

LABORATORY SERVES THE FOLLOWING COURSES

<table>
<thead>
<tr>
<th>Course no.</th>
<th>Courses Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA 118</td>
<td>Chemistry</td>
<td>1st and 2nd</td>
</tr>
</tbody>
</table>