The main object if the final year project is to give the student an opportunity to use the theoretical knowledge he had acquired in solving an engineering problem. In this way he would develop an engineering sense and the ability to analyze problems and produce solutions taking into account economical and environmental factors.

The final year project takes the form of a minor research or development project. The student work is supervised by a senior academic staff member. At the end of the second term, the project is completed and a dissertation must be submitted for assessment as part of the requirement for the B.Sc degree.
INDUSTRIAL MANAGEMENT

Year : FOURTH
Theoretical : 2 hrs/Week
Tutorial : - hrs/Week

Productivity

Production and Productivity, productivity measurements, factors influencing productivity, value added.

Forecasting Analysis

Forecasting by least square, regression method, moving average method.

Linear Programming

Linear programming conditions, mathematical formulation for linear programming, graphical method, algebraic method, simplex method, assignment method.

Replacement Theory

Replacement of items that deteriorate with time, replacement of items of items that fall completely and suddenly, replacement and maintenance.

Decisions

Decisions under certainty, decisions under risk, decisions under uncertainty, decisions under conflict.

Application of Networks in Industrial Projects

The principles of the network, critical path method (CPM), program evaluation and review technique.

Project Evaluation

Stages of evaluation, evaluation under commercial profit, evaluation under social profit, technical evaluation.

Quality Control

Quality control and International Standards Organization (ISO)

Inventory Control

4 Hrs.
MICROWAVE ELECTRONICS

Year: FOURTH
Theoretical: 2 hrs/Week
Tutorial: - hrs/Week

Representations of Two Part Network
6 Hrs.
The Scattering Matrix, Properties of Scattering Parameters, Scattering Parameters of Transistors.

Microwave Components
6 Hrs.
Directional Couplers, Quadrature Hybrids, Attenuator, Filters, Circulators, Mixers, Cavity Resonators.

Microwave Diodes
6 Hrs.
PIN Diodes, Tunnel Diodes, Gunn Diodes.

Microwave Transistor Amplifier Design
12 Hrs.
Power Gain Equations, Stability considerations, DC Bias, Figure of Merit, Operating and Available Power Gain Circles.

Noise, Broadband and High Power Design Methods
12 Hrs.

Microwave Oscillator Design
12 Hrs.
One Port and Two Port Negative Resistance Oscillators, Oscillator Design using Large Signal Measurements, Oscillator Configurations.

Microwave Vacuum Tubes
6 Hrs.
Klystron, Magnetron, Travelling Wave Tubes, Crossed Field Amplifiers.
COMMUNICATION ENGINEERING II

INTRODUCTION

Source of information, uncertainty, information and entropy, discrete memory-less channels, memory channel, channel model BSC and TSC, joint and conditional entropies, capacity and efficiency of symmetric and non-symmetric discrete channels. Optimum threshold mutual information, channel capacity, entropy, channel capacity of a continuous.

SOURCE CODING THEOREM

Mathematical model of information source, Huffman coding, Shannon-Fano codes, types of errors, data compression.

CHANNEL CODING

Source of errors, parity, BRC, information rate, Galois field modern algebra, taxonomy of codes, linear block codes, vector spaces syndrome, minimum distance, error detection & correction, Hamming code, BCH codes, cyclic code, reed-Solomon codes, convolutional encoder (connection of convolutional, representation, code tree, trellis diagram, state diagram), maximum likelihood decoding, viterbi algorithm, trellis-code modulation, turbo code.

DIGITAL COMMUNICATION

Pulse Code Modulation

PCM, Quantization process, Representation of Binary Data, Noise Consideration in PCM system, S/N Performance of PCM, Limitations and Modifications of PCM, Delta Modulation, Delta-Sigma Modulation, Adaptive Delta Modulation, Differential PCM (DPCM), Intersymbole Interference (ISI), Pulse Shaping to Reduce ISI, Equalization, Equalizer Types, Matched Filter.

Digital Modulation


SIGNAL PROCESSING

Digitization of Signals

Sampling of analog signals, sampling theorem, quantization.

Z-Transform

Representation of transfer functions using Z-transform.

Discrete FOURIER Transform (DFT)

Fast Fourier Transform (FFT)

Digital Filters

Transfer functions, finite impulse response filter (FIR), block diagram of FIR, windowing, realization. Infinite impulse response filter (IIR), block diagram of IIR, realization.
### Memory Types and Expansion  
2 Hrs.  
RAM, ROM, PROM, EPROM, EAROM, Static & Dynamic Memories, Memory Cycle Time, Address Decoding, Linear and Matrix Expansion, Virtual Memories.

### MPU Hardware  
8 Hrs.  
Microprocessor Hardware, 32- and 64-bit MPUs, Single Chip Microcomputer 80186, 80286, 80386, 80486, and Pentium, MPU Details.

### Input / Output (I/O) and Buses  
4 Hrs.  
MPU Buses, Serial and Parallel I/O, Programmable I/O, Start-up & Reset, Microcomputer Peripherals.

### Interfacing and Applications  
4 Hrs.  
Buffers, Opto-Compiler & Circuit Protection, Interface Adapters, Multi-Tasking, Time-Delays.

### Microcomputer Software  
8 Hrs.  
Real Mode Software Model of 80386 microprocessor, Real Mode Memory-Address Space and Data Organization, Data Types, Segment Register and Memory Segmentation, Instruction Pointer, General-Purpose Data Register, Pointer and Index Registers, Flags Register, The Stack, Real-Mode I/O address pace.

### Assembly Language Programming  
4 Hrs.  
The 80386 Dx microprocessor Instruction Set, Addressing Modes of The 80386 Dx microprocessor.

### Machine Language Coding and The Debug Software Development  

#### Program of The PC/AT Compatible Microcomputer  
6 Hrs.  
Converting Assembly Language Instructions, to Machine Code, Encoding a Complete, Program in Machine Conder, PC/AT and its DEBRG Program, Input and Output of Data, Assembling Instructions With The ASSEMBLE Command, Debugging a Program.

#### Read Mode 80386 Microprocessor Programming I  
6 Hrs.  
Introduction, Data Transfer Instructions, Arithmetic Instructions, Logic Instructions, Shift Instructions, Rotate Instructions, Bit Test and Bit Scan Instructions.

#### Read Mode 80386 Microprocessor Programming II  
6 Hrs.  
Flag Control Instructions, Compare and Set Instructions, Jump Instructions, Subroutines Loop, String Instructions.

### The 80486 Microprocessor Family  
6 Hrs.  
Internal Architecture of 80486, Read Mode Software Model and Instruction Set, Protected Mode Software Architecture of 80486, Signal Interfaces, Memory and I/O Software Organization, Hardware Organization, Cache Memory.

### The Pentium Processor Family  
6 Hrs.  
Internal Architecture of The Pentium Processor, Software Architecture of The Pentium Processor, Signal Interfaces, Memory Subsystem, Bus Cycles, Non Pipelined, Pipelined, and Burst, Cache Memory, Interrupt and Internal Exceptions.
SOFTWARE & INTELLIGENT SYSTEM

Year: FOURTH
Theoretical: 2 hrs/Week
Tutorial: - hrs/Week

Structured Programming 4 Hrs.
Definitions, Constructs, Graphical design notation, N-S chart, Top-Down Design.

Data Structures 8 Hrs.
Arrays, Stack, Queue, Lists, Trees.

Sorting and Searching 8 Hrs.
Types of sorting algorithms: Bubble sort, Quick Sort, Types of Searching, Binary search Algorithms.

Computer System Components and Operating System Structure 10 Hrs.
Mainframes system, desktop system, parallel system, distributed system, real time system, handled system.
Operating systems structure: system components, OS service, system calls, system programs, virtual machines, system design and implementation, system generation.

Artificial Intelligence (AI) 18 Hrs.
AI Definition, AI Application areas, Neural networks (NN), tasks of NN, biological neuron, Artificial neuron, Neuron modeling, Activation functions, Models of ANN, NN learning rules, Backpropagation methods.

Genetic Algorithms (GA) 6 Hrs.
Definitions, Biological Basis for Genetic Algorithms, GA versus Traditional method, Elements of GA, A simple Genetic algorithms.

Fuzzy System and Algorithm 6 Hrs.
Definitions, Advantages of fuzzy logic, control system, drawbacks of fuzzy system, concept of fuzziness, basic fuzzy operations, fuzzy set theory, fuzzy expert system, simple fuzzy logic.
Integrated – Circuit Fabrication


Basic Logic ( Digital ) Circuits


Very Large Scale Integrated Systems


Switched – Capacitor Filters ( SCF )

SC Networks Principles , Properties of MOS Switched , Capacitors , Operation of ideal SCN , Sampled – Data Waveforms , SCN Transfer Function Relations , Switched Capacitor Filter Design (Second – Order Cascade ) , SC Ladder filters Scaling of SCF.

Radio Frequency Amplifier


Phase Locked Loop

Loop Components , Basic Loop Behavior , Loop Frequency Response and BW , Improving Loop Response , PLLs Compensation , Frequency Synthesizer.
Elective Subject (A)  

Optoelectronics  

Year: FOURTH  
Theoretical: 2 hrs/Week  
Tutorial: 1 hr/Week

Elements of Solid State Electronics  
Review of quantum mechanical concepts, energy band in solids, electrical conductivity, semiconductors. Junctions, the p-n junction in equilibrium current flow in forward and reverse biased pn junction. Junction geometry and depletion layer capacitance, other junction.

Quantum Theory of Radiation  

Light and its Modulation  

Display Devices  

Photodetectors  

Laser Principles  

Laser Engineering Applications  
# Parameters

<table>
<thead>
<tr>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Response</td>
<td>2</td>
</tr>
<tr>
<td>The Difference Amplifier &amp; its D.C Analysis</td>
<td>4</td>
</tr>
<tr>
<td>The Level Shifting &amp; Signal Feedback</td>
<td>4</td>
</tr>
<tr>
<td>Noise</td>
<td>6</td>
</tr>
<tr>
<td>Multiple Transistor Circuits</td>
<td>10</td>
</tr>
<tr>
<td>Application on Op-Amp</td>
<td>6</td>
</tr>
<tr>
<td>Power Amplifier</td>
<td>4</td>
</tr>
<tr>
<td>Sample &amp; Hold Circuits</td>
<td>2</td>
</tr>
<tr>
<td>Frequency Dependent Circuits</td>
<td>10</td>
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<tr>
<td>Stability</td>
<td>4</td>
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<tr>
<td>Switch Capacitor Circuits</td>
<td>6</td>
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<tr>
<td>Sensitivity</td>
<td>6</td>
</tr>
<tr>
<td>Logarithmic Amplifier</td>
<td>2</td>
</tr>
<tr>
<td>Switching Circuits</td>
<td>8</td>
</tr>
<tr>
<td>Advanced Topics on Active Filters</td>
<td>8</td>
</tr>
<tr>
<td>Power Electronic</td>
<td>4</td>
</tr>
</tbody>
</table>
Introduction to Digital Filters

Properties of Discrete – Time Systems; Linear, Stationary, Discrete – Time system; Frequency Response and Transfer Functions.

Finite Impulse – Response (FIR) Filter

Frequency – Domain Description of FIR Filter; Linear- Phase FIR Filter; Types of Linear-Phase FIR Filter; Calculation of Fir Filter Frequency Response; Zero Location For Linear- Phase FIR Filters. FIR Filter Design: Window Method (Basis of the Fourier Series Method; Rectangular Window; Triangular Window; Applying Windows to Fourier Series Filters). Frequency Sampling Methods (Introduction; Odd N versus Even N; Design Formulas; Frequency Sampling Design with Transition-Band Samples, Least Squared Error Frequency-Domain Design. Discrete Frequency Samples; Integral Squared Error Approximation Criterion. Implementation of FIR Filters (Digital Signal Representation; Equations and Structures, Finite Word-Length Effects in Filter Implementation; Design Examples).

Infinite Impulse-Response (IIR) Filters.

Introduction: 2 Hrs.

The application of the computer in electronic engineering, computer aided circuit design, the implementation of CACD techniques.

Network Function Evaluation: 4 Hrs.

Transient response evaluation, Evaluation in the frequency domain-gain and phase, phase delay and group delay computation.

Linear Frequency Domain Circuit Analysis: 6 Hrs.

Two-port analysis, Ladder networks, Nodal analysis, Active device models for linear circuit analysis.

D.C. Analysis of Circuits: 6 Hrs.

Investigation of a simple example, the single variable numerical solution, Formulation of general nonlinear circuit equations, the solution of sets of nonlinear equations.

Transient Analysis: 6 Hrs.

The foundations of transient analysis, formulation of the network equations, for transient analysis, the node voltage states variable formulation, Numerical integration.

Sensitivity and Circuit Optimization 6 Hrs.

Sensitivity calculations, Tolerance Analysis, Optimization Strategies, error criteria, direct search gradient methods, minimizing a function of one variable, constrained optimization.
# MEDICAL ELECTRONICS

**Department of Electrical & Electronic Engineering**  
**Electronic Engineering Section**

**ELECTIVE SUBJECT (A)**

<table>
<thead>
<tr>
<th>MEDICAL ELECTRONICS</th>
<th>EG 408</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year: FOURTH</td>
<td>Theoretical: 2 hrs/Week</td>
</tr>
<tr>
<td></td>
<td>Tutorial: - hrs/Week</td>
</tr>
</tbody>
</table>

## Energy, Work & Power of the Body (2 Hrs.)
Conservation of energy in the body, energy changes in the body, work and power, heat losses from the body.

## Electricity within the Body (4 Hrs.)
The nervous system and the neuron, electrical potential of nerves, electrical signals from muscles (EMG), heart (ECG), brain (EEG), eye (ERG), magnetic signals from heart & brain.

## Biomedical Instrumentation (10 Hrs.)
Biopotentials, electrodes, amplifiers, filters, design considerations, display & recording, interference, biotelemetry sys., applications.

## Sound in Medicine (2 Hrs.)
The body as a drum, ultrasound pictures of the body, ultrasound to measure motion, physiological effects of ultrasound in therapy.

## Light in Medicine (2 Hrs.)
Applications of visible, ultraviolet, and infrared light, lasers in medicine.

## Applications of Electricity & Magnetism in Medicine (2 Hrs.)
Electrical shock, high-frequency electricity, low-frequency electricity and magnetism in medicine.

## Physics of Diagnostic X-Rays (2 Hrs.)
Production of X-Ray beams, Radiation to patient from X-Rays, X-Ray slices of the body.

## Physics of Nuclear Medicine (2 Hrs.)
Radioactivity, sources of radioactivity for nuclear medicine, basic instrumentation and its clinical applications, nuclear medicine imaging devices.

## Radiation Protection in Medicine (2 Hrs.)
Biological effects of ionizing radiation, radiation protection instrumentation, radiation protection in diagnostic radiology, in radiation therapy, in nuclear medicine.

## Computers in Medicine (2 Hrs.)
Patient monitoring, medical record retrieval, computer monitoring and control of life saving (support) equipment, computer image analysis & pattern recognition.
ELECTIVE SUBJECT (B)

DIGITAL IMAGE PROCESSING  

EG 408

Year : FOURTH  
Theoretical : 2 hrs/Week  
Tutorial : - hrs/Week

**Introduction**  
6 Hrs

Image processing concept, digital image processing system, digitization transformer, image representation and image types (binary, Cray-scale, color and multispectral).

**Image analysis**  
18 Hrs

- **Preprocessing**
  region of interest (crop, zoom, shrink, translate and rotate), image algebra, spatial filters, image quantization and gradient function.

- **Edge / Line detection**
  Roberts operator, Sobel operator, Prewitt operator, Kirsch compass mask, Robinson mask, Frei-chen mask and Hough transform.

- **Discrete transforms**
  Fourier transform, cosine transform, walsh transform, filtering transform and wavelet transform.

**Image Enhancement**  
6 Hrs

gray-scale modification, image sharpening and image smoothing
Introduction

6 Hrs.

History of Satellite, Characteristics of Satellite Communications Systems, Orbital Satellites, Geostationary Satellite, Orbital Patterns, Orbital Classifications, Spacing and Frequency Allocations look Angle.

Satellite System Modeling

4 Hrs.

Up-link Models, Down-Link Models, Transponder Models, Comparison Between Transponder Types, Frequency Bands, Characteristics of Satellite Channel.

Satellite System Link Equations (Power Link Budget)

8 Hrs.


Satellite Networks

12 Hrs.


Earth Station Technologies

9 Hrs.

Organization of an Earth Station, Earth Station Design Objective, Earth Station Equipment, Antenna Pointing and Tracking, Mobile and Transportable Earth Station.

Satellite Systems

6 Hrs.

Low-Orbit Satellite (Iridium Satellite), Global Positioning System (GPS).
Pulse modulation 6 Hrs

Sampling Theorem, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Pulse Position & Pulse Width Modulation (PPM & PWM), S/N in Analog pulse Modulation.

Pulse Code Modulation 24 Hrs.


Digital Modulation 30 Hrs.

**Introduction**

Classification of signal and systems, types of response

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**Fourier series**


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**The Fourier transform:**

Definition of the F.T., F.T. properties, products, linear systems and convolution, narrow-band signal.

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**Analog signal processing:**

Signal comparison: correlation, auto-correlation, cross-correlation, correlation function for nonfinite energy signals and for periodic signals, power spectral density, Wiener-Khintchine theorem, white noise, bandlimited white noise, detection by autocorrelation, detection by cross correlation.

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**Discrete signals and their Fourier transform**

Bandlimited signals, uniform sampling of bandlimited function, reconstruction from sampled data, Definition of the F.T., F.T. properties, products, linear systems and convolution, narrow-band signal. Sampling errors, frequency analysis of discrete signals.

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**Discrete system**

Discrete linear systems, the Z-transform, inverse Z-transform, delay operation difference equation, pulse transfer function, discrete convolution, steady-state frequency response of a linear discrete-time system.

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**Digital filters**

Finite impulse response filter (FIR, block diagrams of FIR, Windowing, design of FIR filters. Infinite impulse response filter IIR, block diagrams of IIR, design of IIR filters.

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**The discrete fourier transform and fast computation algorithms**

Windowing of discrete data dft, the D.F.T. properties of D.F.T. The fast Fourier transform FFT.
Introduction:

Historical development, the general system, advantages of optical communications, types of optical fibers.

Optical fiber Wave guides:

Ray theory transmission, electromagnetic mode, theory for optical propagation.

Transmission Characteristics:

Attenuation, material absorption, linear scattering, non-linear scattering, fiber band loss. Dispersion, intarmodal dispersion, intermodal dispersion, modal noise.

Optical Sources:

The semiconductor lasers, laser mode, optical output power, single mode injection laser, the light emitting diode (LED), LED efficiency, characteristics.

Optical detectors:

Optical detection principle, quantum efficiency, responsively, p-n, p-I-n photo diode, avalanche photo diode
Introduction

3 Hrs.

Frequencies used for radio communication, classification of radio frequencies, Ionosphere, skip distance & Maximum usable frequency.

Cellular Concept–System Design Fundamentals

14 Hrs.

Fundamentals elements, frequency reuse, channel assignment strategies, Handoff, interference, capacity, planning Cellular system, improve capacity, trucking, grade of service.

Propagation & path loss

14 Hrs.

Large scale path loss, free space propagation model, reflection, diffraction, scattering, link budget design, log-distance path loss model, long-normal shadowing, small-scale multipath propagation, types of fading, impulse responses model of multipath, mobile multioath channel.

Mobile Networking

10 Hrs.

Introduction, cellular network (BT,BTC,MTSO, Registers,……), difference between mobile and fixed telephone networks, first gen., second gen., third gen.,

Mobile Standard

4 Hrs.

Digital cellular, AMPS, GSM, IS-95, Mobile to satellite
<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> - Integrated Circuits</td>
<td>8</td>
</tr>
<tr>
<td>Advantage of IC Technology, Limitation of IC Technology, Types of Linear ICs, Dynamic Operation of the BJT Switch Technology, Types of ICs, MOS Digital ICs, IC Memory.</td>
<td></td>
</tr>
<tr>
<td><strong>2</strong> - Filters</td>
<td>8</td>
</tr>
<tr>
<td>Filters Transfer Functions, Types of Filters (Passive and Active, LPF, HPF, BPF, RF), (Chebyshev, Butterworth and Bessel Filters), Design of N-Order Filters, Switched Capacitor Filters, Filters Applications.</td>
<td></td>
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<tr>
<td><strong>3</strong> - Tuned Amplifiers</td>
<td>8</td>
</tr>
<tr>
<td><strong>4</strong> - Wave Shaping and Function Generators</td>
<td>6</td>
</tr>
<tr>
<td>Function Generators and Signal Conditioners, Square-Wave Generation Form, Sinusoid, Schmitt Trigger, Pulse Generators, Stair-Case Generators.</td>
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</tr>
<tr>
<td><strong>5</strong> - Switched Mode Power Supplies and Voltage Regulators</td>
<td>8</td>
</tr>
<tr>
<td>Analytical Techniques, Buck Converter, Boost Converter, Buck – Boost Converter, Voltage Regulators, Configurations (Series and Shunt), Integrated Circuits Regulators, Linear Regulators and Switching Regulators.</td>
<td></td>
</tr>
<tr>
<td><strong>6</strong> – Acoustics, Audio and High Fidelity</td>
<td>8</td>
</tr>
<tr>
<td>Acoustics, Basic Components, Other Components, Grounding and Electromagnetic Compatibility and Electrostatic Discharge, Electromagnetic Interference.</td>
<td></td>
</tr>
<tr>
<td><strong>7</strong> – Computers, Internet and Artificial Intelligence</td>
<td>8</td>
</tr>
<tr>
<td><strong>8</strong> – Advanced Transducer Techniques</td>
<td>6</td>
</tr>
<tr>
<td>Types of Transducer (Radio-Frequency and Infrared), Transducer Parameters, Transducer Bridges and Amplifiers, Acoustic Transducers.</td>
<td></td>
</tr>
</tbody>
</table>

**References:**

3. Electronic Devices and Circuits / JIMMIE J.CATHEY.
4. Teach Yourself Electricity and Electronics / Stan Gibilisco.