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

Forecasting Analysis:  
Forecasting by least square, regression method and moving average method.

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

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

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

Application of Networks in Industrial Projects:  
The principles of the network, critical path method (CPM), program evaluation and review technique (PERT).

Project Evaluation:  
Stages of evaluation, evaluation under commercial profit, evaluation under social profit and technical evaluation.

Quality Control:  
Quality control and International Standards Organization (ISO)

Industrial Safety:  
4 Hrs.

TEXTBOOK:  
Recommended by the lecturer
Department of Electrical & Electronic Engineering

Electrical Engineering Division

FOURTH YEAR

**Power System Analysis**

<table>
<thead>
<tr>
<th>Theoretical</th>
<th>Tutorial</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 hrs/Week</td>
<td>1 hrs/Week</td>
</tr>
</tbody>
</table>

**EG 403**

1- **Electrical Power System – Introduction:**

Basics revision regarding, generation, transmission, and distribution Complex power, units, and per unit calculations.

2- **Power System Components:**


3- **Power System Matrices and Calculations:**

Admittance and impedance frames of calculation. The [Z] and [Y] matrices formulation and manipulation.

4- **Load Flow Analysis:**

The load flow equations, formulation and bus designation. Solution methods; Gauss-Siedel and Newton-Raphson. Load flow control.

5- **Fault Analysis:**


6- **Stability Analysis:**


7- **Power System Protection:**

Basic principles and requirements. Relay units and Protection schemes and components.

8- **Power System Earthing:**

Earth resistance and measurements, earthing system components and configurations, step and touch voltages.

9- **High Voltage Engineering:**

Break down in fluid mediums. Impulse generation, transients in power systems (Brief). High voltage testing.

**Recommended (available) textbooks**

Electrical Engineering Division

FOURTH YEAR

Communication Engineering II

<table>
<thead>
<tr>
<th>Theoretical: 2 hrs/Week</th>
<th>Tutorial: 1 hrs/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Information theory</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Introduction:</strong></td>
<td>4Hrs.</td>
</tr>
<tr>
<td>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 nonsymmetrical discrete channel. Optimum threshold mutual information, channel capacity, entropy, channel capacity of a continuous.</td>
<td></td>
</tr>
<tr>
<td><strong>Source coding theorem:</strong></td>
<td>4 Hrs.</td>
</tr>
<tr>
<td>Mathematical model of information source, Huffman coding, Shannon-fano codes, types of errors, data compression.</td>
<td></td>
</tr>
<tr>
<td><strong>Channel coding:</strong></td>
<td>8 Hrs.</td>
</tr>
<tr>
<td>Source of errors, parity, BRC, information rate, Galois field modern algebra, taxonomy of codes, linear block codes, vector spaces syndrome, minimum distance, error detection &amp; 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.</td>
<td></td>
</tr>
</tbody>
</table>

**Signal Processing**

**Digitization of Signals:**

2Hrs.

Sampling of analog signals, sampling theorem, quantization

**Linear convolution and circular convolution:**

4Hrs.

**Z-Transform:**

4 Hrs.

Representation of transfer function using Z-Transform

**Discrete Fourier Transform (DFT):**

4 Hrs.

**Fast Fourier Transform:**

4 Hrs.
Department of Electrical & Electronic Engineering
Electrical Engineering Division

FOURTH YEAR

Digital Filter: 6 Hrs.
Filter design, transfer function, finite impulse response filters (FIR), block diagram of FIR, Windowing, and realization. Infinite impulse response filter (IIR), block diagram of IIR, realization.

Fundamentals of Satellite System

Introduction: 2 Hrs.
History of satellite, characteristics of satellite communications, orbital satellite, 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 models, frequency bands, characteristics of satellite channel.

Satellite system link equation (power link budget): 4 Hrs.
Receiving and transmitting equipment parameters, link losses, Up-link and Down link equations.

Satellite networks: 4 Hrs.
One-way link, two way link, broadcast network, multiple accesses (FDMA, TDMA, CDMA)

Antenna: 6 Hrs.
Definition of antennas, Types of Antenna, main prosperities of antenna, radiation pattern (directivity, gain, efficiency, half-power, beam width, polarization), aperture antennas, array antennas

Textbooks:
Introduction: 4 Hrs.
Concept of power electronic, application, advantage and disadvantage, types of power electronic converter, power electronic modules and smart power control chips.

Power Semiconductor Devices: 6 Hrs.
Diodes, transistors (BJT, MOSFETs, and IGBT) rating and characteristics, thyristor, GTO and MOS, drive and switching aid circuit and cooling, new semiconductor materials.

Uncontrolled and Controlled Converters: 12 Hrs.
Single-phase and three-phase, half wave and full wave, semi and dual converters, harmonic, power factor consideration, effect of source and load inductances.

DC – DC Converters: 8 Hrs.
Step-down and step-up operation, switch mode regulator, Buck, Boost, Bach Boost and Cuk regulator, circuit configuration and analysis with different kinds of load. First, two, and four quadrant chopper.

Inverters: 10 Hrs.
Single and three-phase inverters, voltage source and current source types, voltage control, pulse width type, advanced modulation technique, resonance pulse inverter.

AC – AC Converters: 8 Hrs.
Single and three-phase AC voltage regulator, on-off control and phase control, cyclo-converter, reduction of harmonics.

Static Switches: 4 Hrs.
Single and three phase AC switches, DC switches, solid state relays, design of static switches.

Power Supplies 4 Hrs.
Switched mode DC power supplies, Switched mode AC power supplies.

Software Application 4 Hrs.

Recommended Textbook:
- M.H.Rashid “Power Electronics Circuit and Application”
- Ned Moham “Power Electronic”
- B.K.Bose “Modern Power Electronics”
- Dr.P.S.Bimbhra “Power Electronic”
Single Phase Motors:

Single phase IM, revolving field theory, equivalent circuit, performance calculation, starting methods, speed control, determination of parameters, braking. Single phase synchronous motors, applications.

Special Machine:

AC commutator motors, stepper motor, all kinds of DC motor.

Introduction to Electrical Drives:

Electrical drives, advantages, parts, choice of electrical drives, status of DC & AC drives.

DC drive System:

12 Hrs.

AC drive System:

10 Hrs.

Three phase induction motor drives, synchronous motor drives.

Introduction to Generalized Machine Theory:

Linear transformation in electrical circuits, choice of transformation, invariance of power, matrix equations of basic rotating machines, transformed impedance matrix, torque expressions, linear transformation in machines, application of the theory to AC & DC machines.

Software Application:

2 Hrs.

Recommended Textbook:

- S.Dewan,G.Slemon & A.Straughen, Power Semiconductor Drives
- A.Fitzgerald,C.Kingsley & A.Kusko, Electric Machinery
- Slobodan N. Vukosavic, Digital Control of Electrical Drive
- Dr.ir.Andre Veltman, Fundamentals of Electrical Drive
Department of Electrical & Electronic Engineering

Electrical Engineering Division

FOURTH YEAR

### Advanced Electronics (EG 407)

**Theoretical:** 3 hrs/Week | **Tutorial:** 0 hrs/Week

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**Wave Shaping and Function Generators:**

10 Hrs.

Function Generators and Signal Conditioners, Square-Wave Generation Form, Schmitt Trigger Oscillator, Pulse Generators, and Stair-Case Generators.

**Filters:**

10 Hrs.

Filters Transfer Functions, Types of Filters (Passive and Active, LPF, HPF, BPF, BRF), (Chebysheve, Butterworth and Bessel Filters), Design of N-Order Filters, Switched Capacitor Filters, Filters Applications.

**Radio Frequency Amplifiers:**

10 Hrs.


**IC Technology and Basic Logic (Digital) Circuits:**

10 Hrs.

Advantage of IC Technology, Limitation of IC Technology, Types of Linear ICs, Logic Gate Characteristics, Resistor-Transistor Logic(RTL), DCTL, I^2L, DTL, TTL, Schottky TTL, ECL, NMOS Inverter, Propagation Delay of an NMOS Inverter, NMOS Logic Gates, The CMOS Inverter, CMOS Logic Gates (Transmission and Domino), Emitter – Coupled Logic (ECL) Circuits, Comparison of Logic Families.

**Power Supplies and Voltage Regulator:**

10 Hrs.


**Advanced Transducer Techniques:**

10 Hrs.

Types of Transducer (Radio-Frequency and Infrared), Transducer Parameters, Transducer Bridges and Amplifiers, Acoustic Transducers.

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**Text Books:**

- Stan Gibilisco, "Teach Yourself Electricity and Electronics ", Merrill Publishing Company.