Complementary Electronics for Physics Main

Semester 1
EL 1131-ELECTRONICS I (36 HOURS)

Unit 1  Circuit Elements and Fundamentals (10 hour)


Inductor, Inductor Types- Air core inductor, Iron-core Inductor, Ferrite-core Inductor, Self Inductance, Mutual Inductance, Coefficient of Coupling, Inductors in Series or Parallel without M, series combination with M, Stray Inductance, Reactance offered by a Coil.

Capacitors, Type of Capacitors- Fixed Capacitors, Variable Capacitors, Capacitance, Capacitors in Series and Parallel, Reactance offered by the Capacitor, Cells in Series and Parallel

Unit 2  Network Theorems (6 hour)

Kirchhoff’s Law, Super position theorem, Ideal constant Voltage Source, Ideal constant Current Source, Thevenin’s and Norton’s Theorem, Maximum Power Transfer Theorem(Proof).

Unit 3  Magnetism and A.C (8 hour)

Magnetic Field, Type of Magnets, Magnetic Shielding, Magnetic Terms and Units, Ohm’s Law in Magnetism, Transformer, Transformer working, Transformer Types, Transformer Impedance.

Type of alternating waveforms, Different values of sinusoidal voltage and current, Phase and Phase difference of A.C, Non-sinusoidal waveform, Harmonics, A.C through Resistor, Inductor, Capacitor, L-R, R-C and LCR circuits, Sharpness of resonance, Q-factor, Bandwidth, Tuning of radio, Parallel LCR.
Unit 4 Transient Current (6 hour)


Unit 5 Introduction to semiconductors(6 hour)

Energy Band, Valance band, Conduction Band, Classification of materials based on energy bands, Type of semiconductors-Intrinsic and Extrinsic, hole formation and its movements, Type of Extrinsic semiconductors-P-type and N-type, Drift current in Intrinsic semiconductors.

Books of Study


Semester 2

EL1231 - Electronics II (36 hours)

Unit I Tuning circuits and filters (3 hours)


Unit 2 The P-N junction (5 hours)


The ideal diode – real diode – diode circuits with dc and ac voltage sources– diode
fabrication – clippers and clampers

**Unit 3 Special diodes (3 hours)**


**Unit 4 Optoelectronic devices (3 hours)**


**Unit 5 Regulated Power Supplies (5 hours)**


**Unit 6 Basic Transistor (3 hours)**


**Unit 7 Transistor Characteristics and Approximations (5 hours)**

Transistor static characteristics (input, output and current transfer characteristic) of CB,CE and CC configurations – different ways of drawing transistor circuits – beta rule – importance of $V_{CE}$ cut-off and saturation points – normal DC voltage transistor indications – transistor fault location – solving universal stabilization circuit – applying
AC to a DC biased transistor – transistor AC/DC analysis.

**Unit 8 Load Lines and DC Bias Circuits (5 hours)**


**Unit 9 Transistor Equivalent Circuits and Hybrid Parameters (4 hours)**

DC equivalent circuit - AC equivalent circuit - CB and CE amplifier(DC and AC equivalent circuit) – effect of source resistance on voltage gain – h-parameters – h-parameter notations for transistors – h-parameters of an ideal transistor – h-parameters of ideal CB and CE transistors

**Books of Study**


**Semester 3**

**EL 1331 - ELECTRONICS III (54 Hours)**

**Unit 1 Single Stage Transistor Amplifiers (10 Hrs)**


**Unit 2 Multi Stage Amplifiers (9 Hrs)**
Amplifier Coupling - RC Coupled Two Stage Amplifier - Impedance Coupled Two Stage Amplifier - Transformer Coupled Two Stage Amplifier - Direct Coupled Two Stage Amplifier Using Similar Transistors - Direct Coupled Two Stage Amplifier Using Complimentary Symmetry of Two Transistors - Darlington Pair - Differential Amplifier.

Unit 3 Decibels and Frequency Response (3 Hrs)

Decibel System - Frequency Response - Cut off Frequencies - Alpha and Beta Cut off Frequencies - Gain Bandwidth Product.

Unit 4 Feedback Amplifiers (4 Hrs)


Unit 5 Field Effect Transistors (7 Hrs)


Unit 6 Breakdown Devices (6 Hrs)

Unijunction Transistor (UJT) - UJT Relaxation Oscillator - Silicon Controlled Rectifier (SCR) - Triac - Diac - Silicon Controlled Switch.

Unit 7 Sinusoidal Oscillators (8 Hrs)


Unit 8 Nonsinusoidal Oscillators (7 Hrs)


Books of Study
Semester 4

EL1431 - Electronics IV (54 hours)

Unit 1 Modulation and Demodulation (9 Hrs)


Unit 2 Integrated Circuits (7 Hrs)

components – application of ICs – OP-AMP – ideal operational amplifier – Op-Amp applications (linear amplifier, unity follower, adder, subtractor, integrator, differentiator and comparator)

**Unit 3 Number Systems (6 Hrs)**

Number systems – decimal number system – binary system – binary to decimal conversion – binary fractions – Double-Dadd method – decimal to binary conversion – binary operations (addition, subtraction, multiplication and division) complement of a number – 1’s complementary subtraction - 2’s complementary subtraction – octal number system – octal to decimal and decimal to octal conversion – octal to binary and binary to octal conversion – advantages of octal number system – hexadecimal number system – binary to hexadecimal and hexadecimal to binary conversion.

**Unit 4 Logic Gates (7 Hrs)**


**Unit 5 Boolean Algebra (3 Hrs)**

Unique features of Boolean Algebra – laws of Boolean Algebra – equivalent switching circuits – De Morgan’s Theorems

**Unit 6 Logic Families (6 Hrs)**

Unit 7 Transducers (8 Hrs)


Unit 8 Electronic Instruments (8 Hrs)


Books of Study

1Basic Electronics Solid State – B.L.Theraja, S.Chand & Co. Ltd.