

B.Sc._Electronics_ General_ Syllabus

WEST BENGAL STATE UNIVERSITY

BARASAT, 24 PARGANAS (N)



B. Sc. in Electronics (General) (1+1+1) Years Syllabus

With Effect From: 2009-2010

WEST BENGAL STATE UNIVERSITY

SYLLABUS FOR B.Sc. THREE-YEAR (GENERAL) COURSE IN ELECTRONICS

The present syllabus for B.Sc. three year General Course in electronics has been formed with a view to train up the students with the basic concept of Electronics and its practical application in different areas that undergraduates having Electronics as a paper would be suitable for various types of technical jobs in the Electronics and Computer industries of our country. With this objective some advanced and application oriented topics in Electronics such as microprocessors, communication and microwaves have been incorporated in the syllabus.

Distribution of Papers, Marks and Lectures/Periods

Part-I		F.M: 100	
	Paper	Marks	Lectures/periods
Theory	ELTG 122 101A. Electron Device & Passive Circuits	50 (40+10(internal assessment))	40
	ELTG 122 101B. Linear Active Circuits	50 (40+10(internal assessment))	40
Part-II		F.M: 200	
	Paper	Marks	Lectures/periods
Theory	ELTG 122 201A. Digital Electronics	50 (40+10(internal assessment))	40
	ELTG 122 201B. Modern Electronic Instrumentation	50 (40+10(internal assessment))	40
Practical	ELTG 122 202A. Semiconductor Device & Circuits	50 (35(Exam.)+5(LNB)+10(Viva Voice))	40
	ELTG 122 202B. Instrumentation & Digital Electronics	50 (35(Exam.)+5(LNB)+10(Viva Voice))	40
Part-III		F.M: 100	
	Paper	Marks	Lectures/periods
Theory	ELTG 122 301A. Communication Electronics & Microwaves	50 (40+10(internal assessment))	40
	ELTG 122 301B. Microprocessors & Their Application	30 (20+10(internal assessment))	30
Practical:	ELTG 122 302. Microprocessor based Laboratory Experiments	20 (10(Exam.)+5(LNB)+5(Viva Voice))	20

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ELTG 122 101A- Electron Device & Passive Circuits

(40+10(internal assessment))

40 Lectures/periods

- (a) **Physics of Semiconductors:** Energy band theory of crystal, Metals, Insulators and Semiconductors, Intrinsic Semiconductors, Impurity Semiconductors, p-type and n-type Semiconductors, Indirect band gap Semiconductors, Charge Carrier density, Mobility, Effective mass, Diffusion and Recombination of carriers, Photo-conductivity (Qualitative)
- (b) **P-N Junction in Semiconductor:** Space charge region in a semiconductor junction, potentials and fields, Band diagram, p-n junction as a rectifier, Current components, V-I characteristics, Temperature effects, Varactors, Metal-semiconductor junctions, Reverse breakdown, Zener Diodes (No derivation of expression needed) and application, Light emitting diodes.
- (c) **Bipolar Transistors:** The junction transistor, Current components, Current gain, Transistor as an amplifier, Common base configuration, Static characteristics; Saturation, Active and Cut off regions.
Two port parameters: Relationship between Input and Output voltages and currents; Impedance and admittance parameters; hybrid parameters; Voltage gain, Current gain, Output impedance, Attenuations, Gain, Phase shift, Emitter Follower, Darlington Connection.
- (d) **Metal-Oxide Semiconductor Devices:** The junction Fields effect transistors (JFET): Structure and static characteristics; structure of MOSFET; Enhancement and Depletion MOSFET; p and n-channel MOSFETs; Complementary FETs; Common Source and Common drain configuration; Small signal AC equivalent circuits; FET as a amplifiers; CS and CD amplifiers; High frequency responses; JFET equivalent circuit; Other applications.
- (e) **Transformer:** Construction; Equivalent Circuits; Frequency Response; Autotransformer, Application in Electronic Circuits.
- (f) **Circuit and Network Theory:** Kirchoff's voltage and current laws; Example of loop and nodal analysis, T- Π transformation, Simple problem, Superposition, Reciprocity, Thevenin, Norton, Maximum Power Transfer, Miller, Milman, Bisection theorems, Series and Parallel resonance of LCR circuits; Effect of resistance; Q-factor, Simple problems.

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ELTG 122 101B- Linear Active Circuits

(40+10(internal assessment))
40 Lectures/periods

- (g) **Transistor Biasing**: Different methods; Self-Bias, Stability Factor, Operating Points.
- (h) **Power Amplifiers**: Class A, B, and C amplifiers: Direct coupled, Transformer Coupled amplifier; Push-pull amplifiers; Class A and B Push Pull circuits; Harmonic Distortion; Complimentary Symmetry Amplifier (Qualitative).
- (i) **Feedback in Amplifiers**: General theory of feedback, Negative and Positive feedback; Advantage of Negative feedback; type of Negative feedback in transistor amplifier; Voltage series, Voltage shunt, Current series, Current shunt amplifier; Darlington amplifier (Qualitative).
- (j) **Oscillator Circuits**: Positive feedback and oscillation; Hartley, Wien Bridge and RC-phase shift oscillator.
- (k) **Operational amplifiers**: OPAMPs; Ideal OPAMP; characteristics, Inverting and Non-inverting characteristics, Basic OPAMP application: Adder, phase shifter, AC voltage follower, Comparator, Integrator and Differentiator, Smith trigger.

BOOKS RECOMMENDED

1. Electronic Device and Circuit theory: Boylestad and Nashelaky (Prentice Hall).
2. Electronic Devices and Circuits: Bell (Prentice Hall)
3. Integrated Electronics: Millman and Halkias (Mc- Graw Hill)
4. Electronics: Fundamentals & Application: D. Chattapadhyay and P. C. Rakshit.
5. Cirrcuit Theory: D. Chattapadhyay and P. C. Rakshit.
6. Network Problems: Edminister
7. Circuits and Networks: A. Sudhakar (Tata Mc- Graw Hill)
8. Theory and Problems of Circuit Analysis: Iyer (Tata Mc- Graw Hill)
9. Applications and Design with Analog Integrated Circuits: Jacob (Prentice Hall)

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ELTG 122 201A - Digital Electronics

(40+10(internal assessment))
40 Lectures/periods

- (a) **Number Systems:** Decimal numbers; Binary number; why Binary Number are used; Hexadecimal numbers; BCD Numbers; Conversions.
- (b) **Boolean Algebra:** Boolean Relations: Commutative, Associative and Distributive laws; OR and AND operation; De Morgan's theorems; Sum of Product Method.
- (c) **Logic Gates:** Inverters; OR Gates; AND Gates, NOR Gates; NAND Gates; Exclusive OR and Exclusive NOR gates; Use of Boolean Algebra and De Morgan's theorems in describing operation of Gates.
- (d) **Elements of Logic Families:** Digital Integrated Circuits; levels of Integration; Diode-Transistor Logic; Transistor- Transistor Logic; MOS Logic; CMOS Logic.
- (e) **Combinational Logic:** TTL Circuits: TTL Overview; Implementing Logic Circuits with NAND and NOR Gates; Standard Gate Assemblies; Binary Adder; Half Adder; Full Adder, Arithmetic Function; Decoder; Multiplexer; Encoder.
- (f) **Sequential Circuits:** R-S Latch; Clock Pulse; D Latches; Edge Triggered D Flip Flop; Edge Triggered J-K Flip Flop; J-K Master- Slave Flip Flop; Registers; Shift Registers; Ripple Counters; Synchronous Counters; Ring Counters; Mod-10 Counters; Application of Counters; Read only Memory; Random Access Memory.

ELTG 122 201B- Electronic Instruments:

(40+10(internal assessment))
40 Lectures/periods

- (g) **Electronic Voltmeter:** DC Voltmeters; AC Voltmeters; RMS Voltmeters; General Characteristics of DVM, Ramp type DVM.
- (h) **Regulated Power Supply:** Use of Filters in Rectifiers; Principle of Regulation; Regulated Power Supply using Zener and Transistors; Regulated Power Supply using ICs; short Circuit Protection; Constant Current Supply; Positive and Negative Supplies.
- (i) **LCR Bridges:** General form of AC Bridges; Scherring Bridges; Maxwell Bridges; Anderson's Bridge.

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- (j) **Waveform Generator:** Generation of Triangular and Square Wave and Single Pulse (Monostable) by IC 741 Chip; Introduction to Signal Generator.
- (k) **Cathode Ray Oscilloscope:** Basic CRO Operation; Block Diagram of a CRO; cathode Ray Tube; Construction; Brief Idea about Principle of Focusing and Deflection of Electron Beam; CRT Screens; Vertical Deflection Systems; Basic Elements, Attenuator, Vertical Amplifier, Delay Line; Horizontal Deflection Systems; Sweep Generator; Synchronization of Sweep, Horizontal, Horizontal Amplifier. CRO probes; Application of CRO; Dual Trace and Dual Beam CRO.
- (l) **Q-Meter and Frequency Counter :** Basic Q- Meter Circuits; Q-Measurement Method, Review of Electronic Counter; Principle of Frequency Measurement.

BOOKS RECOMMENDED

- 10. Digital Design: Mano (Prentice Hall).
- 11. Digital Circuits (Vol.I and II): D.R. Chaudhury (Platinum)
- 12. Digital Systems: Principle and Application, Tocci (Prentice Hall)
- 13. Digital Fundamentals: Floyd (Prentice Hall).
- 14. Modern Digital Electronics: R.P.Jain (Tata Mc- Graw Hill).
- 15. Digital Systems: Salibahanan
- 16. Electronic Instrumentation and Measurement Techniques: Cooper (Prentice Hall).
- 17. Electronic Instrumentation and Measurement Techniques: H.S.Kalsi (Tata Mc- Graw Hill)

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ELTG 122 202A- Semiconductor Device and Circuits (35(Exam.)+5(LNB)+10(Viva Voice))
40 Lectures/periods

(1) Study of P-N Junction Diode:

- i) To draw V-I Characteristics for *Forward Bias* and Calculation of *Impedance*.
- ii) To Study Load and Line *Regulation* of a Full Wave Power Supply.
- iii) To Study *Ripple Factor* of Half-Wave and Full-Wave Rectifier with *Π* type Filters; to Study waveform on *CRO*.
- iv) To Study Forward Bias and Reverse Bias Characteristics of a *Zener Diode*.
- v) To Study Load and Line Regulation of a Zener Diode as *Voltage Regulator*.
- vi) To Study Load Regulation of Power Supply with *Zener* or *IC* as Voltage Regulator.
- vii) To Study Percentage *Regulation* and *Ripple Factor* Of stabilized Variable Power Supply.

(2) Study of Transistor:

- i) To Draw the Static Characteristic of a *PNP* or *NPN* transistor in *CB, CC,CE* Mode.
- ii) To find the *hybrid parameters* of a transistor in *DC* mode.
- iii) To Study *R-C* Coupled Amplifier. (To plot Frequency Response and to find the Bandwidth)
- iv) To Study the *Push-Pull Amplifier*. (To plot *Frequency Response* of the Circuit)
- v) To Study *Tuned* Transistor Circuit. (To Find the value of *Q*)

ELTG 122 202B-Instrumentation and Digital Electronics (35(Exam.)+5(LNB) +10(Viva Voice))
40 Lectures/periods

(3) Study with CRO:

- i) Study of Multivibrators.
 - (a) To generate Square wave using *Astable Multivibrator* and to see waveform on *CRO*.
 - (b) To measure the *frequency* of Square wave on *CRO*.
 - (c) To Study the effect of changing *base resistor* or *coupling capacitor* on the frequency of the square wave.
- ii) To observe the output wave shape of *Differentiating and Integrating* circuit on *CRO*.
- iii) To use *Differentiating and Integrating circuits* with Linear *I.C.* and Study the waveform.
- iv) Measurement of *Phase and Frequency* with *CRO*.

(4) Experiments with Linear I.C. (741):

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- i) Offset voltage, Offset current.
 - ii) Adder, Differentiator, Integrator, Comparator, Analog Computation.
(Viz. solution of simultaneous and S.H.M. Equation)
- (5) **Experiments with Digital I.C. s:**
- i) Verification of Basic Truth table of Basic Gates.
 - ii) Study the Flip Flop and Half Adder.
 - iii) Decode Counter & Divide by N Circuits.
 - iv) Verification of Boolean Expressions.
- (6) Project of simple job with servicing of multimeters. *LCR* Meters, *PCB* making and Component assembly.
- (7) i) Measurement of *L* and *C* by *Q*- meter.
ii) Measurement of *Q* of a Coil at Different frequencies by a *Q*-meter.

Rest part of the syllabus will be published in due courses