

The University of Burdwan

Syllabus for B.Sc. General

(1+1+1 Pattern)

in

Electronics

with effect from 2014-2015

STRUCTURE OF THE SYLLABUS (w.e.f. 2014-15 onwards)

PAPER – I (Theoretical)

Full Marks: 100

- Section 1. Solid State Electronics (Electronics of Solids, Semiconductor Diodes, BJT, JFET & MOSFET)
- Section 2. Basic Electrical and Electronic Circuits (Circuit Theory, Transients in Electrical Circuits, AC Circuits and Resonance, Rectifiers & Filters)
- Section 3. Digital Electronics - I (Number Systems, Boolean Algebra, Logic Gates)

PAPER – II (Theoretical)

Full Marks: 100

- Section 1. Amplifiers (using BJT)
- Section 2. Oscillators (Sinusoidal & Non Sinusoidal)
- Section 3. Operational Amplifier (Theory & Applications)
- Section 4. Digital Electronics - II (Combinational and Sequential Logic Circuits, Introduction to Microprocessors and Computers)
- Section 5. Electronic Communication - I (Analog Modulation and Demodulation (AM & FM), Propagation of Radio Waves)
- Section 6. Cathode Ray Oscilloscope (CRO)

PAPER – III (Practical)

Full Marks: 100

PAPER – IV A (Theoretical)

Full Marks: 65

- Section 1. Special Semiconductor Devices
- Section 2. Measurements and Instruments
- Section 3. Transducers and Sensors
- Section 4. Electronic Communication - II (Antenna, Transmitters and Receivers, Transmission Line, Optical Fibre)
- Section 5. Television

PAPER – IV B (Practical)

Full Marks: 35

B.Sc. PART- I ELECTRONICS (GENERAL) SYLLABUS

Paper – I (Theoretical Paper)

Full Marks: 100

Section 1. Solid State Electronics

Electronics of Solids: 08 Lectures

The atomic structure, Energy band diagram and classifications of solids, Metals, insulators and semiconductors (Qualitative discussions only), Doping in semiconductors, P-type and N – type semiconductors, Transport parameters, Current flow in semiconductors, Diffusion and Drift currents.

Semiconductor Diodes: 06 Lectures

PN Junction, Diode characteristics, Junction capacitance, Breakdown in PN Junctions, Zener diode.

Bipolar Junction Transistors: 10 Lectures

Bipolar Junction Transistors (NPN & PNP), Principles of operation, Different modes of operations, Input and output characteristics, Operating point and load line, Biasing of BJT (PNP and NPN), idea of bias stability, Factors affecting Stability, Stability factor, Fixed bias, Self bias, Voltage divider biasing.

JFET & MOSFET: 06 Lectures

Junction FET, Principles of operation and characteristics of JFET, MOSFET, Enhancement and Depletion MOSFET, Static characteristics of MOSFET.

Section 2. Basic Electrical and Electronic Circuits

Circuit Theory: 10 Lecturers

Resistance, Capacitance and inductance (self and mutual) idea of transformer, Constant voltage and current generators, Kirchhoff's laws (mesh and nodal analyses). Network theorems: Thevenin's, Norton's, Superposition and Maximum Power Transfer theorems.

Transients in Electrical Circuits: 04 Lectures

Growth and decay of current in LR circuit, Charging and discharging in CR circuit, Time constant.

AC Circuits and Resonance: 06 Lectures

AC response of LR, CR and LCR circuits, Power factor, Analyses of series and parallel resonant (LCR) circuit, Bandwidth, Selectivity & Q-factor.

Rectifiers and Filters: 10 Lectures

Half wave, Full wave (center tapped and bridge type), Ripple factors, Efficiency of rectification, Effects of different types of filter circuits such as C, L. and π – type (Qualitative discussions only), Percentage regulations, Use of Zener diode as voltage regulator.

Section 3. Digital Electronics - I

Number systems:

08 Lectures

Decimal, Binary, Octal, Hexadecimal, Signed integer number representation, 1's complement, 2's complement, Binary addition, and subtraction of binary numbers in 2's complement scheme.

Boolean Algebra:

06 Lectures

Basic laws of Boolean operation, Boolean identities, De Morgan's theorems, logic simplification, Karnaugh Map (SOP and POS).

Logic Gates:

06 Lectures

OR, AND & NOT gates, Universal logic gates, EX-OR & EX-NOR gates.

Text & Reference Books

- Electronics Fundamentals and Applications – Chhattopadhyay & Rakshit (Current Edition). New Age International
- Basic Electronics Solid State – B.L.Theraja (Current Edition).
- Principles of Electronics – V.K.Mehta & R Mehtal, S. Chand
- Elements of Electronics – Bagde, Singh & Singh.
- Fundamentals of Electricity & Magnetism – D.N.Basudeva.
- Electronics - B.Ghosh.
- Electricity & Magnetism – Mahadeb Das Khan
- Modern Digital Electronics – R.P.Jain, Tata Mc Graw Hill
- Digital Principles and Applications – Malvino & Leach (Current Edition). Tata Mcgraw Hill
- Digital Principles – Floyd.
- Principles of Electronic Devices & Circuits, Theraja & Sedha, S.Chand
- Fundamentals of Digital Circuits, A. Anand Kumnar, PHI
- Digital Electronics, G.K.Kharate, Oxford University Press

B. Sc. Part - II Electronics (General) Syllabus

Paper – II (Theoretical Paper)

Full marks: 100

Section 1. Amplifiers (using BJT): 16 Lectures

AC equivalent circuit: h-parameters, Small signal analysis of low frequency transistor amplifier (current and voltage gain, input and output impedance).

Direct coupled and RC coupled amplifiers (qualitative discussion only), Single tuned amplifier (qualitative discussion only).

Power amplifier: Class - A and Class - B power amplifier's, Class - B push-pull amplifier (Basic idea only).

Feedback in amplifier: General theory of feedback, negative and positive feedback's; Types of negative feedback in amplifier: Current series, voltage series, current shunt and voltage shunt feedbacks (Basic idea only).

Section 2. Oscillators: 06 Lectures

Sinusoidal: Oscillation from LC Circuits, Positive feedback and oscillation, Barkhausen criterion, Collector tuned transistor oscillator, Phase shift oscillator, Crystal oscillator (qualitative discussion only).

Non Sinusoidal: Astable Multivibrator (qualitative discussion only)

Section 3. Operational Amplifier: 08 Lectures

Differential amplifier, CMRR, Ideal and practical OP-AMP, Open-loop voltage gain, Inverting amplifier, Concept of virtual ground, Phase shifter, Adder, Non-inverting amplifier, Unity gain buffer, Differentiator, Integrator.

Section 4. Digital Electronics – II: 10 Lectures

Combinational and Sequential Logic Circuits:

Half adder, Full adder, Comparator, MUX and DEMUX

R-S latches, S-R & J-K flip-flop, D flip-flop's, T flip-flop.

Introduction to Microprocessors: 05 Lectures

Fundamentals of Microprocessors, Microprocessors as single chip CPU, ALU, Structure of 8085 μ p.

Computer Basics:**05 Lectures**

Computer generation, I/O, CPU, Primary and secondary memory, High level and lower level languages, Translators.

Elements of Computer Programming:**10 Lectures**

Problem solving using computers-Algorithm and flow chart, Sequential structure, Selective structure, Loop structure, Subprograms, Simple programs using C language.

Section 5. Electronic Communication - I**Analog Modulation and Demodulation (AM & FM):****10 Lectures**

Need for modulation, Modulating signal, Carrier signal, Types of modulation.

Amplitude Modulation: Modulation index, Percentage modulation, Frequency spectrum, Side band frequencies, Power carried by carriers and side bands, Basic Principle of Collector modulated AM circuit.

Frequency Modulation: Mathematical representation, Maximum frequency deviation, Modulation index, Band width in FM, Basic principles of FM generation.

Demodulation: Diode detector circuit, FM de-modulation technique.

Radio wave propagation:**08 Lectures**

Characteristics of EM wave, Modes of propagation (ground, sky, ionospheric and satellite), Reflection from ionosphere, Critical frequency, Virtual height, MUF, Skip distance, Multi-hop transmission, Satellite communication (qualitative discussions only).

Section 6. Cathode Ray Oscilloscope (CRO): 07 Lectures

Electron emission from solids, Thermo-ionic emission, Different types of emitter, Cathode Ray Tube, Fluorescent screen, Focusing, Motion of electrons in electric field, Deflection sensitivity.

Basic elements of CRO, Horizontal and Vertical deflections, Time base circuit, Synchronization.

Applications of CRO to measure voltage, frequency and phase difference of AC signals.

Text & Reference Books

- Electronics Fundamentals and Applications – Chhappadhyay & Rakshit (Current Edition). New Age International
- Basic Electronics Solid State – B.L.Theraja (Current Edition).
- Principles of Electronics – V.K.Mehta (Current Edition).
- Elements of Electronics – Bagde, Singh & Singh.
- Electronics - B.Ghosh.
- Electronic Measurements & Instrumentation – R. S. Sedha.
- Electronic Instrumentation – H.S.Kalsi. Tata McGraw Hill
- Electrical Measurements and Measuring Instruments – Golding and Widdis.
- Electronic instrumentation & measurement techniques – Helfrick & Cooper.
- Fundamentals of Computer – Rajaraman.
- Principles of Communication Engineering – Anokh Singh.
- Radio Engineering – G.K.Mithal.
- Electronic Communication - R.L. Shrader .
- Modern Digital Electronics – R.P.Jain.
- Digital Principles and Applications – Malvino & Leach (Current Edition).
- Digital Principles – Floyd.
- *Microprocessor* - Suni Mathur, PHI
- *Microprocessors, Interfacing and applications*, Renu Singh and B.P.Singh, New Age international

- *Computer concepts and C programming*, Gupta, Wiley India

Paper – III (Practical Paper)

Full Marks: 100

List of Experiments

Group-A

1. Verification of Thevenin's theorem and Maximum Power Transfer theorem.
2. P-N Junction diode characteristics.
3. Characteristics of Zener diode.
4. Transistor output characteristics (CE & CB Modes)
5. Characteristics of JFET.
6. Study of basic logic operations using universal logic gates.
7. Measurement of Amplitude, Frequency & Phase difference by CRO.

Group-B

1. Study of half wave and full wave rectifier with (Capacitor) & without filter.
2. Study of single stage CE mode of transistor amplifier.
3. Study of single stage CC mode of transistor amplifier.
4. Study of R-C phase shift oscillator.
5. Use of OP-Amps as inverting and non-inverting amplifiers with dc input.
6. Use of OP-Amp as an Integrator.
7. Use of OP-Amp as an Adder.

Students require to perform two experiments taking one from each Group at the time of final examination. Signed laboratory note book showing the records of practical classes is mandatory for appearing in the final examination. Examination will be of six hours duration.

The distribution of marks is as follows:

40 marks for each experiment, 10 marks for laboratory note book and 10 marks for viva-voce at the time of examination.

B.Sc. PART-III Electronics (General) Syllabus

Paper – IV A (Theoretical Paper)

Full Marks: 65

Section 1. Special Semiconductor Devices

06 LECTURES

SCR, UJT, LED, LCD – Principles of operations & applications.

Section 2. Measurements and Instrumentation 10 LECTURES

Ammeter and voltmeter (D.C. & A.C), extension of range, sensitivity, loading effect, ohmmeter

(series type & shunt type), continuity checking, watt meter (qualitative idea only).
Operating principles of general AC bridge, Maxwell bridge, Schering bridge.

Section 3. Transducers and Sensors

10 LECTURES

Classification of transducers (based on physical phenomenon, power type, electrical phenomenon), Strain gauge, Thermistor, Capacitive microphone, Loudspeaker, Photoelectric cell, Solar cell, Thermocouple.

Section 4. Electronic Communication - II

Antenna

04 LECTURES

Dipole antenna and Yagi antenna (qualitative discussions only).

Transmitters and Receivers

06 LECTURES

Block diagrammatic description of AM and FM transmitters, information about practical systems (AM, FM), Different types of radio receivers, Principles of super heterodyning.

Transmission Line

06 LECTURES

Transmission line, Basic line equation, Primary line constants, Propagation coefficients, Characteristic impedance.

Optical Fibre

06 LECTURES

Elementary idea of Optical Fibre, Classification, propagation of light waves, Acceptance Angle and Numerical Aperture, Applications.

Section 5. Television

12 LECTURES

Television standards, Principles of picture transmission in TV, Scanning, Picture and sound broadcasting, Practical TV channels.

PAPER - IV B (PRACTICAL PAPER)

FULL MARKS – 35

LIST OF EXPERIMENTS:-

1. R.C. coupled amplifier.
2. Astable Multivibrator.
3. Diode Detector.
4. Logic circuits (Half Adder & Full Adder) using NAND NOR only.

PROJECT WORK:-

1. Regulated power supply.
2. Amplifier.
3. Oscillator.
4. Digital counter.

N.B - Either 3 out of 5 experiments or 1 project and 2 experiments have to be practised (at least).

Marks distribution: -

Laboratory note book	05
Internal assessment	10
Final examination	20 (one experiment only)

Students must appear at the practical examination failing which no marks out of 35 would be awarded to him / her.

Reports on the experiments and project work are to be written on note books by the students under the guidance of the class teachers. Each report will consist of

- 1) The names and specifications of the instruments and components to be used.
- 2) The schematic plan for assembling them
- 3) Result of the experiment or the test- report of the project work
- 4) Any modification for the improvement and
- 5) Final result.

Daily reports on the work are to be signed by the teachers regularly. No lab note book other than that used in the lab – classes will be accepted.

Text & Reference Books

- Electronic Measurements & Instrumentation – R. S. Sedha.
- Electronic Instrumentation – H.S.Kalsi.
- Electrical Measurements and Measuring Instruments – Golding and Widdis.
- Electronic instrumentation & measurement techniques – Helfrick & Cooper.
- Basic Radio & Television – S.P. Sharma.

- Basic Television and Video Systems – Grob.
- Radio Engineering – G.K.Mithal.
- Principles of Communication Engineering – Anokh Singh.
- Electronic Communication – R.L. Shrader.
- Electronics Fundamentals and Applications – Chhattopadhyay & Rakshit (Current Edition).
- Electronics (Classical and Modern) – R.K.Kar.
- Basic Electronics Solid State – B.L.Theraja (Current Edition).

- A Course in Electrical & Electronic Measurements & Instrumentation
- A.K. Sawhney, Dhanpat Rai