



(...Nurturing Talents to Success)

**DR. A P J ABDUL KALAM UNIVERSITY,
INDORE**

SYLLABUS

For

DIPLOMA ELECTRONICS & TELECOMMUNICATION

(SECOND YEAR, IIIrd SEM)

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for Diploma Electronics & Telecommunication

List of Subject (Second Year, IIIrd Semester)

S. No.	Subject Code	Subject name	Page No.
1	ECD 301	ELECTRONIC COMPONENTS AND MATERIALS	3
2	ECD 302	ELECTRONIC DEVICES AND CIRCUITS	5
3	ECD 303	BASIC ELECTRICAL ENGINEERING	7
4	ECD 304	NETWORK ANALYSIS	9
5	ECD 305	DIGITAL ELECTRONICS	11
6	DE 9999	PROFESSIONAL ACTIVITIES	13

Unit 1

Conductors and Insulators: Introduction, Atomic Structure, band structure of solids, energy band diagram of Conductors, semiconductors and insulators, reliability specifications for electronic components stability, drift , catastrophic failure, MTBF, MTTF, resistivity of conductivity as a basic material property, conductivity / resistivity of different types of materials, effect of temperature on conductivity, low, medium & high resistivity materials, their electrical and mechanical properties and applications. electrical , thermal and other physical & chemical properties of insulating materials, Classification of insulating materials. properties & applications of Insulating materials, Difference among conductor, Insulator and semiconductors based on: atomic structure, band theory. Role of semiconductors in making semiconductor devices. fluid and Solidifying Dielectric materials and solid dielectric materials, Different types of fuses and their applications. Different types of cables and their applications.

Unit 2

Magnetic Materials: Introduction, Properties of magnetic materials, Permeability, B-H curve and hysteresis effect, curies temperature, Residual magnetism, Factor affecting the properties of magnetic materials such as: over, temperature, mechanical damage, and direction of current, Classification of magnetic materials such as: hard and soft magnetic, materials, Dai, para, ferro & ferri magnetic materials, and ferrite materials.

Unit 3

Jointing and Cleaning Materials: Jointing techniques, Screw jointing, Soldering and welding, Types of screw heads, screw shafts, Soldering: Types of solders (soft & hard), soldering process, Different soldering materials used in electronics, Adhesives. Cleaning Materials: IPA (Isopropyl alcohol), CT(Carbon tetra chloride), Acetone Etc.

Unit 4

Cells and Batteries: Principle of a cell , theory of operation , Concept of Ideal voltage and current source. internal resistance , Ampere hour rating , Primary and secondary cells and batteries. Types of primary cells: carbon - zinc , mercury oxide, silver oxide , lithium. Types of secondary cells; Lead storage battery Solar cells. Primary and Secondary cells & batteries. maintenance requirements for various batteries ; Choice of Batteries for different applications.

Unit 5

Relays and Switches: relay Characteristics ; relay performance ; Contact types; Specifications and applications of different types of relays. Switches: Types of manually operated switches, their features and applications, Manually operated Selector Switches , Keyboards and sensing switches ; Their principle of operation and applications. Types, Operation, and applications of electrically operated switches.

Unit 6

Connectors and Packages: level of connections, generic types and specifications of connecting devices for connection levels 2, 3 and 4, ratings and specifications of connectors, types of Connectors, Factors affecting choice of connectors ; choice of connectors for different applications.

References

1. Electronic Component by Padmanaban
2. Electronic Component by Ramachander
3. Electronic Components & Materials - LM Prepared at IIT, Delhi under Project IMPACT
4. Electrical Engineering Materials by TTTI , Madras
5. Electrical Engineering Materials by Indulkar and Tiruvenkadam
6. Electrical Engineering Materials by M. L . Guptha.
7. Electrical Engineering by P.L.Kapoor

Unit 1

PN Junction Diodes: Basic Structure and symbol, Forward & Reverse Biasing, V-I Characteristic, Various application of Junction Diode, Special purpose Diodes: Constructional features, symbol and applications of – Zener Diode, Tunnel Diode, Schottky Diode, Varactor Diode, Photo Diode, LED, Switching (Step – recovery) Diode. Specifications

Unit 2

Diode Circuits: Need of rectification, Types of rectifier: Half Wave, Full Wave and Bridge rectifier, Comparison, Average, Peak and rms Values, Filter Circuits: Need of Filter Circuits Types of filter circuits: capacitor, L- type and pie type, Ripple factor, Bleeder Resistance, Rectifier with filter, Basics of Voltage multiplier, Clipping Circuit, Clamping circuit.

Unit 3

Junction Transistors: Bipolar Junction Transistor (BJT): Basic Structure, Types: PNP & NPN transistors, Transistor action, Check and identify the transistor leads, transistor as a three terminal network, Transistor Configuration: CE, CC and CB mode, V -I characteristics: Input and Output Characteristics, Regions of Transistor operation, active, saturation & cutoff Expression for currents: Alpha (α) and Beta (β), relation between, alpha & beta, Transistor as a Switch, Transistor Biasing : fixed bias, Base Bias, Emitter feedback Bias, Collector feedback Bias, Voltage divider Bias, Emitter Bias, transistor specifications

FET (Field Effect Transistor): Types of FET, Compare FET with BJT, FET operation, V -I characteristics, FET applications, MOSFET and CMOS, Introduction to MESFET

UJT (Unijunction Transistor): Structural diagram of UJT, working of UJT, Applications of UJT in relaxation oscillator and blocking oscillator

Unit 4

Amplifiers: Transistor as an Amplifier, CE Amplifier, Cascading of Amplifier, Meaning & necessity of cascade amplifier, Circuit Diagram of cascade amplifier with transistor coupling: RC coupling, Direct Coupling, Transformer coupling. Classification of Amplifiers: Class A, class B, class AB & class C amplifier. Distortion in amplifiers: Amplitude or Non linear distortion, Frequency Distortion, Phase shift distortion, Frequency response of amplifier, Feed Back Amplifier: Importance & concept of Feed Back, Advantage of negative feedback, block diagram of a feedback amplifier, Darlington Pair, Power Amplifiers, Audio Power Amplifier, Push pull Amplifier, Phase Splitter

Unit 5

OSCILLATOR: Principle of Oscillator, Barkhausen circuit criteria for oscillation, Types of Oscillators: Phase shift oscillator, Resonance – Circuit LC oscillator, Wein Bridge oscillator, Colpits Oscillator, Hartley Oscillator, Crystal Oscillator **Multivibrators:** Basic form of operation, Astable (free running) multivibrator, Monostable (Single shot) multivibrator, Bistable (Trigger) Multivibrator

References

1. Electronics Principles by Malvino
2. Electronic Devices & CKTs by Mottershead
3. Integrated Electronics by Millian & Halikyas
4. Electronic Devices & Circuits By Robert Boylestad
5. Electronic Devices and Circuits by Millman & Halkias
6. Electronic Devices and Circuits by Mathur & Chadha
7. Solid State Devices by Streetman
8. Basic Electronics by V.K. Mehta

List of Experiments

1. To plot the V-I characteristics of a –
(a) Silicon Diode (b) Germanium Diode
2. To verify the action of diode as a positive clipper and negative clipper.
3. To verify the action of diode as a positive clamper and negative clamper.
4. To verify the V-I characteristics of Zener Diode.
5. To obtain the input and output Transistor Characteristics for CB configuration.
6. To obtain the input and output Transistor Characteristics for CE configuration.
7. To obtain the input and output Transistor Characteristics for CC configuration.
8. To verify the operation of FET as a switch.
9. To verify the V-I Characteristics of UJT.
10. 10.To setup the circuit and verify the waveforms of (I) HW rectifier (ii) FW (centre tapped) rectifier (iii) Bridge rectifier
11. 11.To observe the output waveform of a rectifier circuit with (I) capacitor filter (ii) L-inductive filter
12. To observe the performance (frequency response) of a CE amplifier.
13. To observe the performance (frequency response) of an emitter follower amplifier.
14. To determine the overall voltage gain and frequency response of two stage cascade amplifier.
15. To analyze the performance of a class A amplifier.
16. To observe the characteristics of (I) current series feedback amplifier (ii) voltage series feedback amplifier.
17. To setup a RC phase shift oscillator and analyze its operation.
18. To verify the action of UJT as a relaxation Oscillator.
19. To setup the circuit and observe the action of astable, monostable and bistable multivibrator

Unit 1

Laws of Basic Electricity: Energy, nature of electricity, electric circuits and diagrams, the international system of units, scientific notation and engineering prefixes, current and Voltage, the coulomb, the ampere, potential difference, conventional current, Ohm's law of constant proportionality, Define resistance, types of resistance, Factors governing resistance, Dependence of resistance upon temperature, voltage, magnetic field, light, pressure and their typical applications, non linear resistors, series and parallel combination of resistance, equivalent resistance, work and Power, energy and work, efficiency, kilowatt-hour, interrelationship of basic electrical units.

Unit 2

Magnetic Fundamentals: magneto motive force, reluctance, permeability, flux density, magnetic field intensity, magnetic materials, magnetization curves, Hysteresis, magnetic effect of electric current, electro magnetic induction, eddy current, magnetic shielding.

Unit 3

AC Fundamentals: Concepts of alternating voltage and current, Difference between AC and DC voltage, Concepts of Cycle, Frequency, Period, Amplitude , Instantaneous value, average value, RMS value, Peak value and form factor. the radian, Graphical presentation of different periodic waves (signals), instantaneous current in an ideal inductor, inductive reactance, instantaneous current in an ideal capacitor, capacitive reactance, impedance, Phasors and relation of V & I Phasors in RL, RC and RLC series circuit, representation of sine waves on Phasors diagrams, Phasors algebra related to RL, RC, and LC circuits with sin wave input. Impedance and admittance, impedance triangle. Concepts of real (Watt), reactive (VARs) and apparent power (VA) and power triangle.

Unit 4

Transformers: use of transformer (Electronics & Electrical), definition of transformer, Principle of working of transformer, construction of transformer, Classification based on core construction, elementary theory of an ideal transformer, EMF equation of a transformer, Voltage transformation ratio(K) And Impedance ratio, Elementary Knowledge of Special Types of transformers- Auto transformer, Ferrite core type, Potential Transformer (PT) and Current transformer (CT).

Unit 5

DC Machine: Basic Working Principles of D.C. Generator and Motors, comparison of generator and motor action, significance of Generated emf and Back emf and their voltage equations, Different types DC motor. Basic methods of speed control of a DC motor, Basic motor characteristics- Torque Vs Armature current, Speed Vs Armature current, Speed Vs Torque, Application of DC motor in electronics and electrical

Unit 6

AC Machine: Types of ac machines, construction of motor, Basic working principle of operation, production of rotating magnetic field, Basic knowledge of slip in induction motors, Torque-slip characteristic of induction motor, Basic methods of speed control of induction motor, construction of a single phase induction motor, Elementary Knowledge of different types of single phase induction motor. Their applications in industries & house holds.

Unit 7

Electrical Safety Measure: Need of earthing, Protection against electric shocks.

References

1. Electrical technology – Volume I & II by B.L.Theraja
2. Fundamentals of Electrical Engineering Technology by V. Deltero.
3. Electric Circuits by Schaum Series
4. Basic Electricity by Van Valkenberg
5. Electricity by Richard J. Fowler
6. Grob Basic Electronics by Bernard Grob

List of Experiments

1. Identify various resistances and understand their specifications
2. Identify various capacitors and understand their specifications
3. Familiarization of Digital Multimeters and Analog Multimeters
4. Measure hot and cold resistance of filament of electric bulb
5. Verification of Ohms law
6. Series and parallel combination of resistance
7. Measurement of single phase power by using Wattmeter, Ammeter and Voltmeter
8. Series resistive-capacitive (R-C) circuits
9. Series resistive -inductive (R-L) circuits
10. Series resistive inductive and capacitive (R-L-C) circuits
11. Demonstrate various transformers and understand their specifications
12. Extending the range of basic meter movement: a) Meter Multipliers b) Meter shunts
13. Study of fan regulator circuit (Resistive & Electronic)
14. Study of tube light circuit
15. Speed control of DC shunt motor.
 - (a) By varying field current-armature voltage kept constant.
 - (b) By varying armature voltage – field current constant.

Unit 1

Network Transformation: Introduction, Topology-Definitions, Nodes, Branches, Tree, Co-Tree, Twigs, Tie-Set, Cut-set, Indices Matrix, Reduced Indices Matrix, KVL analysis, KCL analysis, Mesh and node circuit analysis, Principle of duality, Reduction of complicated network, Conversion between T and π (pie) Section, Superposition Theorem, Reciprocity Theorem, Thevenin's Theorem, Norton's Theorem, Millman Theorem, Maximum Power transfer theorem, Mutual Impedance and their dot conversion, Delta and Wye (Y) Transformation.

Unit 2

Resonance: Quality Factor or Q- Factor, Series Resonance, Resonance frequency, Bandwidth and Selectivity of Series resonance circuit, Parallel Resonance or Anti Resonance, Resonance frequency, Band Width and Selectivity of Parallel Resonance circuit, Phasor diagrams for L-C, R-L,R-C and R-L-C Circuits.

Unit 3

Steady State & Transient Response: Analysis of step and sinusoidal inputs, Steady state & transient response for RL Circuit, RC Circuit, forced and unforced response.

Unit 4

Filters: Introduction, Decibel & Neper- Definitions, Classification of Filters according to Pass & Stop Bands, Constant K Low pass filter, Constant K High pass filter, Band pass and band elimination filter, Elementary m-Derived filter, Elementary Composite Filters

Unit 5

Two Port Network & Their Parameters: Short Circuit. Admittance parameters, Open circuit Impedance parameters, Z parameters, Y Parameters, Hybrid Parameters, Transmission Parameters, Inverse transmission Parameters, Introduction to Image impedance, Symmetric Network, Ladder network, Bridge 'T' network, Parallel 'T' network, Lattice network, Attenuators, types of attenuators, Basics of Equalizers and types.

Unit 6

Laplace Transformation: Initial condition in elements, A procedure for evaluating initial condition, The Laplace transformation, Laplace transform of elementary function, Application of Laplace transform for transient and steady state behaviour of RL ,RC and RLC circuits.

References

1. Networks Lines by Umesh Sinha
2. Networks, Lines and Fields by Ryder
3. Network Analysis by G. K. Mithal
4. Network Analysis by Van Volkenberg
5. Electric circuits by E Administer

List of Experiments

1. Familiarization of CRO
2. Familiarization of Function Generator
3. Pass band check of low pass, high pass, band pass, band stop filters
4. To study and Verify Super position theorem
5. To study and Verify Reciprocity theorem
6. To study and Verify Thevenin theorem
7. To study and Verify Norton theorem
8. To study and Verify KCL AND KVL
9. Series resonance circuit
10. Parallel resonance circuit

Unit 1

Number System and Binary Codes: Binary, Hexadecimal, Octal, Decimal and their inter conversion, 1's complement, 2's complement numbers, 9's complement & 10's complement, Introduction to Binary codes, Weighted, Non Weighted codes, Excess 3 code, Grey code, BCD code, Hamming code.

Unit 2

Boolean Algebra & Logic Gates: Introduction to Boolean Algebra, Law of Boolean Algebra, De Morgan's theorem, Simplification of Boolean functions with Boolean laws, Karnaugh Map method, simplification of Boolean equation using K-Map(up to four variables).

Unit 3

Logic Families: Introduction to logic families, DTL, ECL, TTL, C-MOS and their comparison on the basis of their characteristics. Familiarization of ICs related to digital circuits like 74 series, 50 series.

Unit 4

Combination Logic: Half adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder, Binary Subtractor, Encoder, Decoder, Multiplexer, Demultiplexer.

Unit 5

Sequential Logic Circuits: Definition of Sequential circuits, Definition of Latch & Flip-Flop and their differences. RS Flip-Flop, JK Flip-Flop, D Flip-Flop, JK Master-Slave Flip-Flop with their timing diagrams and truth tables. Definition of Register, Shift Register, Buffer Register with their timing diagrams and truth tables. Definition of Counters, Synchronous, Asynchronous, Up-Down Counter, Ring Counter.

Unit 6

A/D & D/A Converter: Introduction to A to D and D to A converter, Successive Approximation method and Ladder N/W method for A/D & D/A conversion. **Programming Logic Devices:** Description of programming logic devices: PAL, PLA, GALs, FPLA, PLD, CPLD, And FPGA. **Memories:** Introduction to memories. Types of memories: Primary & Secondary. Primary memories: RAM and their types, ROM and their types. Flash memories Secondary memories: Floppy disk, Hard disk, CD-ROM, Blue Ray Disc.

References

1. Digital Systems by Ronald Tocci
2. Digital Electronics by Malvino-Leach
3. Digital Fundamentals by Thomas L.Floyd
4. LM on Digital Electronics by NTTF Electronics Centre, Bangalore
5. Digital Electronics by Gothman
6. Digital Electronics by Malvino-Brown
7. Digital circuits by Ananth Kumar
8. Digital Design by Morris Mano

List of Experiments

1. Study of Logic Gates- AND, OR, NOT, X-OR, X-NOR.
2. Study of Universal Gates-NAND, NOR.
3. Implementation of Basic Gates with the help of Universal gates
4. Study of BCD to Grey code Conversion.
5. Implementation of De Morgan's Theorem.
6. Study of combinational Logic. Half Adder, Full Adder, Half Subtractor,
7. Full Subtractor, Encoder, Decoder, Multiplexer, Demultiplexer.
8. Study of Comparator.
9. Study of latch & RS flip flop.
10. Study of of D flip flop, JK-flip flop, JK master slave flip flop.
11. Study of digital troubleshooting with:
 - a) Logic Prob
 - b) Current Tracer,
 - c) Logic Pulsar
 - d) Logic Chip
 - e) Logic Comparator
 - f) Logic Analyzer

Professional Activities is not a descriptive course, as per conventional norms; therefore specific content for this course cannot be prescribed. It is a group of openended activities; where in variety of tasks are to be performed, to achieve objectives. However general guidelines for achieving the target and procedure for its assessment are given under the course content. As the student has to practice this course in all the six semesters, the guidelines given therein are common and applicable to each semester.

Objectives:

To allow for professional development of students as per the demand of engineering profession.

- To provide time for organization of student chapter activities of professional bodies) i.e. Institute of engineers, ISTE or Computer Society of India etc.)
- To allow for development of abilities in students for leadership and public speaking through organization of student's seminar etc.
- To provide time for organization of guest lectures by expert engineers/ eminent professionals of industry.
- To provide time for organization of technical quiz or group discussion or any other group activity.
- To provide time for visiting library or using Internet.
- To provide time for group discussion or solving case studies.
- To provide time for personality development of students.
- To provide time for working for social cause like awareness for environmental and ecology etc.

DETAILED INSTRUCTIONS TO CONDUCT PROFESSIONAL ACTIVITIES:

A. Study hours, if possible should be given greater time slot with a minimum of two hrs/week to a maximum of four hrs/week.

B. This course should be evaluated on the basis of grades and mark sheet of students, should have a separate mention of the grade awarded. There will be no pass/fail in professional activities (PA).

C. Following grade scale of evaluation of performance in PA has been established. Grades Level of performance

A Excellent

B Good

C Fair

D Average

E Below Expectations

D. Grades once obtained in a particular examination shall become final and no chance of improvement in grades will be given to the students.

E. Assessment of performance in PA is to be done internally by the Institution, twice in a Semester/Term through a simultaneous evaluation of the candidate by a group of three teachers, of the deptt. Concerned. Group of teachers will jointly award the grade to candidate in the assessment. Best of the grades obtained by the student in these two assessments shall be finally taken on the mark sheet of the respective Semester/Term. Candidate abstaining from the

prescribed course work and/or assessment planned at the Institute shall be marked ABSENT in the mark sheet, instead of any grade.

F. While awarding the grades for performance in PA, examining teacher should reach the final consensus based on the attendance, punctuality, interest, presentation skills in seminar on the topic assigned (collection of relevant data, observations, analysis, findings/conclusion) and its written report, awareness of latest developments in the chosen programme of study.

G. Institution shall maintain the record of grades awarded to all the students in PA for a period of 1 year.

H. It shall be mandatory for students to submit a compendium for his PA in the form of a Journal.

I. Compendium shall contain following:

1. Record of written quiz.
2. Report/write up of seminar presented
3. Abstract of the guest lectures arranged in the Institution.
4. Topic and outcome of the group discussion held.
5. Report on the problems solved through case studies.

6. Report on social awareness camps(organized for social and environmental prevention).

7. Report on student chapter activities of professional bodies like ISTE, IE (India), CSI etc.

J. PA is not a descriptive course to be taught in the classroom by a particular teacher. Various activities involved in the achievement of objectives of this course should be distributed to a number of teachers so that the talent and creativity of group of teacher's benefit the treatment of the course content. These activities should preferably be conducted in English language to maintain continuity and provide reinforcement to skill development. Small groups shall be formed like in tutorials, group discussion, case studies, seminar, project methods, roll play and simulation to make the development of personality affective. Treatment of PA demands special efforts, attention, close co-operation and creative instinct on the part of teachers of department concerned. Since this course is totally learner centered, many of the activities planned under this course shall come out from the useful interaction of student, among themselves and with the teachers. The guide teacher/s shall best act as a facilitator of these creative hunts/ exercises, which unfold many of the hidden talents of the students or bring out greater amount of confidence in them, to execute certain activity.