



(...Nurturing Talents to Success)

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

SYLLABUS

For

DIPLOMA ELECTRONICS & TELECOMMUNICATION

(3rd YEAR, 5th 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 (3rd Year, 5th Semester)

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Unit 1**Electronic Instrumentation System**

- Block diagram
- Review of primary sensing elements and Transducers.
- Signal conditioning: Block diagram of
 - DC system
 - AC system
- Data acquisition system (block Diagram)

Unit 2**Data transmission and Telemetry**

- Introduction
- Method of Data Transmission
- General Telemetry System
- Type of Telemetry System
- Brief Description of land line and R.F. telemetry system.
- Signal conditioning and data acquisition system.

Unit 3**Displays and Recorders**

- Displays:
 - Analog Indicator /Displays
 - Digital indicator/Display
 - Light Emitting Diodes
 - Liquid Crystal Displays
- Recorders:
 - Graphic Recorders
 - Strip chart recorders
 - X-Y Recorders
 - Ultra-Violet Recorders

Unit 4**Control System**

- Basic concept of open loop and closed loop control system and their comparison
- Transfer function definition
- Simple Mathematical problems on block diagram and signal flow graphs.
- Simple Mathematical model of physical systems
- Analogy between different systems- Mechanical, Electrical, Thermal .

Unit 5**Time Domain Analysis**

- First and Second order control System (Without mathematical treatment)
- Definition of different performance indices as delay time, rise time, peak time, percentage peak overshoot, Settling time, steady state error.
- Type-0, Type -1, type-2, system definition
- Concept of stability: absolute stability, relative stability
- Routh and Hurwitz Criteria for stability.

Unit 6

Root Locus Techniques

- Introduction
- Root Locus concept
- Construction of Root Loci

Unit 6

Frequency Domain Analysis

- Introduction
- Nyquist Stability Criteria
- Bode plots of simple control system

LIST OF EXPERIMENTS

- 1) To design practical circuits from the theoretical class room learning of
 - a. Photo electric system for –
 - 1) Measurement of speed
 - 2) liquid level measurement
 - 3) Linear speed measurement
 - 4) Tracking luminous object
 - 5) Any other application
 - b. Water level indication and control systems
 - c. Temperature control systems
 - d. Pressure measurement system
 - e. density measurement
- 2) To design basic automatic system
- 3) To measure the resistance of LDR with the source of light at deferent distances
- 4) To measure the resistance of LDR with different color light.
- 5) To observe the effect of temperature on the resistance of thermister.
- 6) Visit to Industrial units where instrumentation and control system is utilized.
- 7) To draw the block diagram of sequential control system
- 8) To study a microprocessor controlled industrial control system.
- 9) Visit of automatic bottling plant.

LIST OF EQUIPMENT

1. Digital/ Analog Multimeter
2. Function Generator/ Pulse Generator
3. Dual Power Supply
4. Cathode Ray Oscilloscope (C.R.O.)
5. Control System Lab Module
6. PLC Trainer
7. Water Level Control by PLC
8. Elevator control by PLC
9. Temperature control by PLC
10. Traffic Light Control by PLC
11. Optical Transducer Trainer
12. Temperature Transducer Trainer
13. LVDT Trainer
14. Strain Gauge Trainer
15. Relay Control Trainer
16. PID Controller Trainer
17. Digital Control Training System
18. Analog Control Training System

Reference Books

1. Modern Electronic Instrumentation and Measurement Technique by Cooper
2. Electrical Measurements & Measuring Instruments by H. W. Golding
3. Electrical and Electronic Measurements and Instrumentation by S.Ramabhadran
4. Instrumentation Devices & Systems by Rangan
5. A course in Electrical & electronic measurement & instrumentation by A.K. Sawhney.
6. Automated Process Control Systems by Ronald & Hunter
7. Control System Engineering by Nagrath & M. Gopal
8. Linear Control System by Manke
9. Process Control Instrumentation Technology by Curtis D. Johnson
10. Control System Technology by C.J. Chesmond
11. Feedback Control Systems by Charles L.Philips & Royce D. Harber
12. Control system: Scheum Series

Unit 1**Introduction to Data Communication**

- Introduction
- Data Transmission mode: simplex, half duplex, full duplex
- Difference between Digital and Data Communication
- Serial and parallel data transmission
- Character codes:
 - Baudot code - ASCII code
- Error Detection techniques:
 - VRC - LRC - CRC
- Error Correction techniques:
 - symbol substitution - Retransmission - Forward Error Correction (Hamming Code)
- Serial Transmission: Asynchronous and Synchronous data transmission

Unit 2**Hardware and Interface**

- Data communication Hardware: basics and applications of:
 - DCE - DTE - UART - USRT
- Data communication interfaces: specifications and applications of:
 - RS 232C - USB
- Data MODEMS:
 - Need of a Modem - Bandwidth, Data rate and Baud rate
 - Baseband and Broadband systems - Types of Modems

Unit 3**Introduction to Networks**

- Definition of Computer Network
- Applications of Computer Networks
- Categories Networks: LAN, MAN and WAN
- Concept of Protocol
- Open System Interconnection (OSI) Model: Layer Architecture, brief function of layers
- Switching: Circuit switching, Packet switching and Message switching techniques
- Introduction to Integrated Service Digital Network (ISDN) and its Applications

Unit 4**Local Area Network**

- advantages of LAN
- Network topologies: Mesh, Star, Tree, Bus and Ring, comparison
- Component of Computer Networks: Understand working and application of:
 - Server & Workstation - NIC - Hub (Active/Passive)
 - Repeater - Switch - Bridge
 - Router - Gateway
- Cabling: structure and specifications of:
 - UTP, STP, Co-axial and Optical Fiber
- Access Methods: CSMA/CD and Token Passing
- Types of LAN: Ethernet, Token Ring and FDDI; comparison
- Knowledge of LAN Software: WIN NT, WIN2000, LINUX

Unit 5

Inter Networking

- Structure of Internet
- Goals of Internet
- TCP/IP Protocol suite
- Comparison between OSI and TCP/IP
- IP addressing concept
- address classification- class A, class B, class C addresses
- domain Name System (DNS) and Uniform Resource Locator (URL)
- Internet services: E-mail, FTP and Telnet

List of Experiments

1. Study of various data transmission cables like coaxial, UTP and optical fiber and their connectors
2. study of RS 232C interface
3. study of different type of Modem
4. Study of Network Operating Systems available in the Lab
5. Installation and Configure Server and Workstation software
6. Study of Various Interconnecting devices like NIC, Hub, Switch etc.
7. study of Internet for data transfer and its various applications

List of Equipment

1. Computers for Server and Workstations
2. Data Communication Trainer
3. Local Area Network Trainer
4. Multimedia Computer Trainer
5. Baseband Transmitter Training System
6. ISDN Trainer
7. Network Cables with RJ Connectors
8. Modem

Reference Books

1. Data communication and Networking by Behrouz A. Forouzan
2. Data communication by William Schweber
3. Computer Networks by Tenenbaum
4. Introduction to Digital & Data communication by Michael A. Miller
5. IBM PC and Clones by Govindrajalu
6. Electronic Communication Systems by Wayne Tomasi
7. Welcome to Internet by Tom Badgett and Corey Sandler
8. Web Based Learning Material on Computer Networking by IIT, Mumbai

Unit 1**Review of the characteristics of power electronics devices power diode, SCR, TRIAC, DIAC, UJT & Power Transistors:**

- Static & Dynamic Characteristics
- Turn On & Turn off methods(communication)
- Selection & technical Specification (data-Sheet)
- Protection against over voltage & over current

Unit 2**Single phase and three phase rectifier Diode & SCR:**

- Uncontrolled with R load under continuous current mode function
- Controlled with R load under continuous current mode function
- Input & output wave form
- Quantitative description and comparison of technical parameters such as Vdc, Vrms, efficiency, RF etc.
- Merits & Demerits

Unit 3**Triggering Circuits**

- Principle features of firing circuits
- UJT pulse triggering circuits
- Phase Shift Triggering

Unit 4**Inverter and Chopper**

- Principle
- Types and classification
- Transistorized inverter and chopper
- 3 Phase operation of inverter
- Practical Applications of each

Unit 5**Simple speed control methods of DC and AC motors**

- Speed torque characteristics of DC & AC motor.
- Methods of Speed control (AC&DC)
- Basic Elements /Components of Speed Control (AC&DC)
- Open loop & closed loop methods (AC&DC), Block Diagram
- Armature & Field Control, Block Diagram(DC)
- Frequency & Slip Control block Diagram (AC description)
- Choice between AC & DC Drive

Unit 6

Miscellaneous applications of power electronics

- Introduction
- Principle & working
- Different types
- Block Diagram
- Practical Applications of the followings:
 - UPS
 - Resistance Welding
 - Diathermy
 - Ultra Sonic
 - RF Heating
 - Electronic Ignition

List of Experiments

Study of wave forms and characteristics of

1. 3 phase H/W diode rectifier
2. 3 phase H/W SCR rectifier
3. 3 phase Bridge rectifier
4. 3 phase bridge SCR rectifier
5. 1 phase transistorized inverter (low power)
6. 1 phase shift inverter
7. Phase shift trigger circuit
8. UJT as a relaxation oscillator
9. Transistorized chopper circuit
10. DC Motor speed control – a. open loop b. closed loop
11. AC Motor speed control – open loop only
12. Study of UPS
13. Study electronic ignition for two wheelers and four wheelers using service manual
14. Visit a ultrasonic diagnostic centre
15. Visit a Repairing centre for microwave only.

LIST OF EQUIPMENT

1. Power Electronics Trainer Kit
2. SCR Triggering Circuit Trainer
3. IGBT Characteristic Trainer
4. Series Inverter
5. Three Phase Rectifier Module
6. Single Phase Converter Firing trainer
7. Single Phase Controlled Rectifier
8. Single Phase Converter
9. UPS Trainer
10. Dual Power Supply
11. Function Generator
12. C.R.O (Cathode Ray Oscilloscope)
13. Power Scope for 3 Phase Measurement
14. Multimeter

Reference Books

1. Thyristorized Power Controller by Dube- Dorodla-Joshi- Sinha
2. Power Electronics by M.H.Rashid
3. Electrical Machinery by P.S. Bimbhra
4. Power Electronics by P.C.Sen
5. Thyristor Engineering by M.S.Berde
6. Thyristorized Power Controller by Sugandhi & Sugandhi
7. Industrial Electronics by G.K.Mithal

Unit 1**Wave Propagation:**

- Ranges of Electromagnetic waves for Communication
- frequency-wavelength relation
- attenuation of EM waves in air
- review of Reflection, refraction, interference, diffraction and Polarization of EM waves
- Ground wave propagation
- Space wave propagation: radio horizon, fading
- Sky wave propagation:
 - Ionosphere layers
 - day and night effect
 - Reflection & refraction of radio waves in ionosphere
 - Critical frequency and Maximum usable frequency
 - Optimum working frequency
 - Skip distance and single hop/multi hop transmission.
- Frequency ranges, advantages & disadvantages, applications of above modes of EM wave propagation.
- Tropospheric scattering and Duct propagation

Unit 2**Transmission lines & their characteristics:**

- Parallel wire and co -axial cables
- Primary and secondary constants of transmission line, equivalent circuit
- Propagation constant, attenuation constants
- Transmission line losses
- Characteristics impedance of parallel wire and co-axial cable
- Incident wave, reflected wave and standing wave
- Standing wave ratio (SWR) and Reflection coefficient
- Open circuit and short circuit lines, Voltage and current distribution
- Impedance matching:
 - Need
 - quarter wave transformer matching
 - stub matching

Unit 3**Waveguides and components:**

- Waveguides concept
- Comparison with transmission lines
- Rectangular and circular waveguide comparison
- Cutoff wavelength and frequency in Rectangular waveguide
- Dominant TE₁₀ Mode: field pattern & its excitation in rectangular waveguide
- Waveguide passive components: List and their uses

Unit 4

Microwave devices:

- Microwave Solid State devices:
 - Limitations of transistors at microwave frequency, microwave transistors
 - Concept of negative resistance devices
 - Parametric amplifier (PARAMP) and frequency converters
 - Gunn effect and Gunn diode oscillators

- Microwave Tubes:
 - Limitation of conventional tubes,
 - Theory, performance characteristics and Applications of:
 1. Klystron amplifier
 2. Reflex Klystron
 3. Traveling Wave Tube (TWT)
 4. Magnetron

Unit 5

Antenna Fundamental & their characteristics:

- Introduction: antenna as a radiator
- Reciprocity
- Radiation resistance
- Efficiency
- Radiated field strength at a point
- Isotropic radiator
- Gain & Directivity
- Radiation pattern and Beam width
- Bandwidth of an antenna
- Antenna Polarization
- Effective height and effective aperture

Unit 6

Type of Antenna and their uses:

- Dipole antenna, half wave antenna and folded dipole, distribution of voltage & current for half wave dipole
- Antenna arrays: need of array, parasitic and driven elements, broad side & end fire array
- Physical Structure and applications of the following Antennas:
 - Marconi antenna
 - Parabolic reflector antenna
 - Loop & helical antenna
 - Turnstile antenna
 - Yagi-Uda Antenna
 - Horn antenna
 - Log periodic antenna

List of Experiments

1. Demonstration of microwave component
2. Study of VSWR meter.
3. Measurement of frequency of microwaves
4. Measurement of standing wave ratio (VSWR) and reflection coefficient.
5. Measurement of cutoff wavelength (TE₁₀ mode) Using $c=2/(m/a) + (n/b) = 2a$
6. Measurement of guided power in waveguide and Transmission lines.
7. Measurement of attenuation in dB for a given component.
8. Measurement of characteristics of klystron tube.

9. Measurement of V-I characteristics of Gunn Diode.
10. Performance of Gunn Oscillator.
11. Measurement of attenuation in dB for a given component.
12. Measurement of radiation pattern for different antenna.
13. Power Measurement in Transmission lines and Waveguide.

List of Equipment

1. Antenna Trainer
2. Microwave Test Benches
3. Wave and Propagation Trainer
4. Microwave Integrated Circuit Trainer
5. Microwave Power Meter
6. Dual Power Supply
7. Function Generator
8. C.R.O. (Cathode Ray Oscilloscope)
9. Multimeter

Reference Books

1. Electronic Communication System by Kennedy
2. Microwave devices & circuits by Liao
3. Microwaves by Gupta K.C.
4. Antennas by Kraus
5. Electronic Communication System by Tomasi
6. Electronic Communication System by William Schweber
7. Electronic Communication by Terman
8. Microwave Engineering and Application by Om P. Gandhi (Maxwell Macmillan Edition.)

Unit 1**Electrical & Electronics Maintenance**

Awareness of cleaning of dust & corrosion, Oiling & greasing for lubricating of moving parts of tools and equipment, Protection of tools & equipment from dust and temperature.

Unit 2**Review of Tools and Electrical Accessories**

- Identification and selection of tools like Pliers, screw drivers, Poker, Hammer, Hacksaw, Firmer, Hand drill, Phase tester
- Study of different types of wires and their specifications.
- Study of Switches, resistors, capacitors and transformers.

Unit 3**Electronic Work Shop**

- Material required in electronic work shop like tag points, terminal soldering metal flux etc.
- Identification & testing of electronic components including ICs and SMDs.
- Soldering: selection of soldering iron, Soldering metal flux, soldering technique, de soldering technique,
- AC & Dc voltage & current measurement with multimeter, continuity test, measurement of resistance.

Unit 4**P.W.B. Fabrication**

- Specify the need of PWB in electronic circuits.
- Merits and Demerits of PWB
- Describe the methods of PWB making: photo printing and screen printing.
- Describe features of different types of copper clad and laminates.
- State properties and applications of various types of PWB's like single layer, double layer and multiplayer.
- PWB Fabrication for SMD components
- PWB Designing using software like Circuit Maker etc.

Unit 5**Designing and Fabrication of Small Electronic Project**

- Use data book to get the relevant information of components.
- Check digital and Linear IC's on bread board with the help of data book
- Make Art work for a small project
- Prepare the PWB for the project.
- Check and test the PCB
- Fabricate cabinet.
- Prepare project report
- Demonstrate the function / working of the prepared project.

List of Equipment

- | | |
|---|------------------------------|
| 1. UV Exposure | 2. Dip Coating Machine |
| 3. Curing Oven | 4. Electronic Tool Kit |
| 5. Mechanical Tool Kit | 6. Crimping Tools |
| 7. Clamping/ Tong Tester | 8. Etching Machine |
| 9. Temperature Controlled Soldering Iron unit | 10. Shearing Machine |
| 11. Bench Drill Machine | 12. Coil Winding Machine |
| 13. Compressor/Blower | 14. Bench vise |
| 15. Hand Drills | 16. Chemicals for PCB Making |
| 17. Multimeters | 18. Art Work Table |
| 19. Screen Printing Table | 20. Panel Meters |
| 21. Art Work Material | |
| 22. Computer with PCB Design Software | 23. Printer and Scanner |

Reference Books

- (i) The Design and drafting of Printed Circuits by – Mr. Darryl Lindsey
- (ii) Printed Circuit Boards Design and Technology By – Walter and Bosshart.

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 open-ended 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

<u>Grades</u>	<u>Level of performance</u>
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 dept. 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 cantered, 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.