Faculty of Engineering & Technology

P.K.University

Shivpuri (MP)

Evaluation Scheme & Syllabus for

Department of Electronics & Communication Engg.

(VI Semester)

(Effective from session 2025-26)

DIPLOMA -ELECTRONICS & COMMUNICATION ENGINEERING

Study And Evaluation Scheme For Diploma Electronics & Communication Engineering

YEAR -2ND /SEMESTER -4TH

SUBJECTCODE	SUBJECTSNAME	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	Int +Ext
DPROGEC401	Programming In C & C++	3	0	0	3	30	-	30	70	-	70	100
DNETWEC402	Networks, Filters & Transmission Lines	4	0	0	4	30	-	30	70	-	70	100
DPRINEC403	Principles of Communication Engg	3	0	0	3	30	-	30	70	-	70	100
DPRINEC2404	Principles of Digital Electronics	4	0	0	4	30	-	30	70	-	70	100
DPROGEC405	Programming In C & C++ Lab	0	0	2	1	-	25	25	-	25	25	50
DNETWEC406	Networks, Filters & Transmission Lines Lab	0	0	2	1	-	25	25	-	25	25	50
DPRINEC407	Principles of Communication Engg Lab	0	0	2	1	-	25	25	-	25	25	50
DPRINEC408	Principles of Digital Electronics Lab	0	0	2	1	-	25	25	-	25	25	50
	Total	14	0	8	18	120	100	220	280	100	380	600

II Year IV Semester

DPROGEC401
PROGRAMMING IN C & C++

(L-T-P-3-0-0)

(Common to Instrumentation & Control Engg.)

DETAILED CONTENTS

1. CONCEPT OF PROGRAMMING:

Concept of Flowcharting, algorithm, programming, Structured Programming Various techniques of programming, Use of programming.

2. PROGRAMMING IN C:

Data Types, Operators and Expressions; Input & Output print If, scanf, clibrary Control Statement: IF- ELSE, While, For, Do- While, Switch; Functions and modular programming; Scope of variables, parameter passing, recursion, block structure; preprocessor statements; pointers and arrays; structures and unions; File handling.

3. CLASSES & OBJECT:

What is a class, what is an object, constructors,types of object(external,automatic static, Dynamic objects) Metaclass,role of meta class.Scope of classes, array of objects, objects as a function argument.

4. PROGRAMMING IN C++:

What is object-orientation, area of object technology, C++, getting to grips with C++(data types,escape sequence,characters, variables, operator, notation, Arrays,Function conditional statements.call by value,call by reference.Pointer : C++ memory map, dynamic allocation pointers,pointers with arrays.Structure,structure with arrays,passing, structure of function.Enumerated data types, Inherentance, apolymorphism & Overloading.

Department of Electronics & Communication Engineering

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II Year IV Semester

DNETWEC402
NETWORKS, FILTERS & TRANSMISSION LINES

(L-T-P-4-0-0)

DETAILED CONTENTS

1. REVIEW OF NETWORK THEOREMS:

Review of the following, network theorem; superposition, Thevenin's Norton's and maximum power transfer.

2. NETWORKS:

2.1 One Port Network : Series and parallel tuned circuit, expression for their impedance at any freququency and at resonance in terms of Q and component values (L. C. & R). Band width of tuned circuit in terms of resonance frequency and Q.

2.2 Two Port (Four Terminals Networks : Basic concept of the following terms

(a) Symmetrical and asymmetrical networks.
(b) Balanced and unbalance network,
(c) T-network, Ladder network, Lattice network, L Network, Bridge T-network.
(d) Representation of a two port " Block Box" in terms of Z, Y and H parameters and mention of application to transistor as a two port network.

3. SYMMETRICAL AND ASYMMETRICAL NETWORK :

3.1 Symmetrical Network :

(a) Concept and significance of characteristics impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.
(b) Exprssion for characteristic impedance, propagation constant, attenuation constant and phase-shift constant in terms of Zo, Zoc and Zsc for the following
(i) T Network.
(ii) n (pi) Network.

3.2 Asymmertrical Network :

(a) Concept and significance of iterative impedance image impedance, image transfer constant and insertion loss.
(b) The half section (L-section) : Splitting of symmetrical T & n(pi) sections into half sections, derivation of iterative impedance, image impedance open and short circuit impedance of half section.

3.3 Star-Delta Transformation : Equivalence of T and n(pi) network.

4. ATTENUATORS:

4.1 Units of attenuation (decible and nepers)
4.2 General characteristics of attenuators.
4.3 Analysis and design of simple attenuator of following types

(a) Symmetrical T and n type.
(b) L type.

5. FILTERS:

5.1 Brief idea of the uses of filters networks in different communication system.
5.2 Connecting of low pass, high pass, band pass and band stop filters.
5.3 Theorem connecting attenuation constant a and characteristics impedance (Zo) determination of cut off frequency constant K section.
5.4 Prototype filter section
(a) T and n low pass filter section.
- Reactance frequency characteristics of low pass and its significance.
- Attenuation Vs frequency; phase shift Vs frequency characteristics impedance Vs frequency of T and n.
- Simple design problems of prototype low pass section.

5.5 Active Filter:
Basic Concept of active filter and comparison with passive.
(a) Op. amp. intergrater circuit, basic low pass active filter, First and Second order low pass Butter worth filter - Frequency response.
(b) Op. amp. differentiator circuit, basic high pass active filter, First and Second order high pass Butter worth filter- Frequency response.
(c) Basic concept of band pass filter, Wide and narrow band pass active filter.
(d) Basic concept of band reject filter, wide and narrow band reject filter.
(e) All pass filter, Frequency response

5.6 Crystal Filter :
(a) Crystal and its equivalent circuit.
(b) Design properties of piezoelectric filters and their use.

5.7Equalizers : General
Introduction.

6. TRANSMISSION LINE:

6.1 Transmission lines and their application : Shapes of different types of transmission lines; including 300 ohm antenna feeder cable, 75 ohm co-axial cable, optical fiber cable, Also other different types of cables.
6.2Distributed (or primary) constants of a transmission line equivalent circuit of infinite line;
6.3Necessity of the concept of an infinite line; Definition of characteristic impedance of line ; concept of short line termination in Zo currents no voltages long an infinite line; graphical representation; propagation constent, attenuation and phase shift constant of the line.
6.4Relationship of characteristics impedence, propagation canstant, attenuation constant and phase constant in term of distributed constants of the line, smith charts.
6.5Conditions for minimum distortion and minimum attenuation of signal on the line; necessity and different methods of loading the communication lines.
6.6Concept of reflection and standing waves on a transmission line; definition of reflection coefficient in terms of characteristics impedance and load impedance; Definition of standing wave ratio (SWR), relation between VSWR and voltage reflection coefficient, maximum impedance on a line in term of characteristics impedance and VWSR.
6.7 Transmission line equation; expression for voltage, current

and impedance at a point on the lines for lines with and without losses. Expression for the input impedance of the line. Solving Transmission line problems using Smith Chart.

6.8 Input impedance of an open and short circuited line and its graphical representation.

6.9 Transmission line at high frequency, effect of high frequencies on the losses of a transmission line; Application of transmission line as a reactive components and imdedance transformer (e.g. quarter wave and half wave transformer).

6.10 Principle of impedance matching using single stub; comparison of open and short circuit stubs.

6.11 Expression for characteristic impedance of open wire and coaxial lines (No derivation).

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II Year IV Semester

DPRINEC403
PRINCIPLES OF COMMUNICATION ENGG.

(L-T-P-3-0-0)

1. INTRODUCTION

1.1 Brief idea of various types of communication system.
1.2 Need of modulation and demodulation in communication system.
1.3 Types of modulation-Brief description and typical application of AM, FM, phase modulation and pulse modulation (PAM, PPM and PCM).

2. AMPLITUDE MODULATION

2.1 Derivation of expression for an amplitude modulated wave. Carrier and side bands, modulation index and depth of modulation.

2.2 Relative power distribution in carrier and side bands.
2.3Elementary idea of DSB, DSB-SC, SSB, SSB-SC modulation and their comparison.
2.4 Vestigial side band modulation and its application.

3. FREQUENCY MODULATION

3.1 Derivation of an expression for frequency modulated wave and its frequency spectrum (without analysis of Bassel = function) Modulation index, Maximum frequency deviation and deviation ratio.
3.2Advantages and disadvantages of FM over AM in communication systems based on consideration of band width requirement and noise.

4. PHASE MODULATION

Expression of phase modulated wave and its comparison with frequency modulation. (Brief introduction only)

5. PULSE CODE MODULATION

5.1 Elementry idea of sampling theory and pulse modulation; Shanon's theorm and coding technique, Quantization (Brief idea only).
5.2Time Division and frequency division multiplexing, CDMA, WDMA, FDMA and TDMA (Brief Idea Only).
5.3 PCM system, Types of PCM and its application.
5.4 Digital Modulation Techniques (ASK, FSK, PSK, DPSK) (Brief Idea Only).

6. PRINCIPLE OF AM MODULATORS

6.1 Working principles and typical application of
- Collector Modulator.
- Base Modulator.
- Balanced Modulator.

6.2 Single-Side-Band (SSB) generation and its typical applications.

7. PRINCIPLE OF FM MODULATORS

7.1 Working principle and applications of reactance tube modulator, varactor diode modulator and armstrong phase modulator.
7.2 Limiter, pre-emphasis and de-emphasis in FM communication system.

8. DEMODULATION OF AM WAVES

8.1 Principle of demodulation of AM wave using diode detector circuit; concept of diagonal clipping and formula for RC time constant for minimum distortion (No derivation).
8.2 Comparison of typical diode detector circuits in a Radio and TV receiver.

9. DEMODULATION OF FM WAVES

9.1 Basic principles of detection of FM waves.
9.2 Foster-seely discreminator and its working principles.
9.3 Working of Ratio-detector circuit and its advantage over Foster-seely discriminator circuits.
9.4 Basic principle of Quadrature detection.

10. TRANSMITTERS

10.1 Classification of transmitters on the basis of power, frequency and modulation.
10.2 Block diagram of an AM transmitters and working of each stage. Low level and High level modulation.
10.3 Block diagram and working principle of reactance tube and Armstrong FM transmitters.

11. RADIO RECEIVER

11.1 Brief description of crystal and TRF radio receivers; Need for and principles of superheterodyne radio receiver.
11.2 Block diagram of super-heterodyne AM receiver, function of each block and typical waveforms at the input and output of each block.
11.3 Block diagram of an FM receiver, function of each block and wave/forms at input and output at different blocks.

12. ANTENNA AND PROPAGATION

12.1 Physical concept of radiation of electromagnetic energy from an antenna, relationship between the direction of electric and magnetic fields with direction of propagation; concept of polarization of EM waves.
12.2 Electromagnetic spectrum and its various range VLF, LF, HF, VHF, UHF, Micro wave, Optical waves etc.
12.3 Definition and physical concepts of the terms used with antennas like point source, gain, power gain, directivity aperture, effective area, rediation pattern, (field strength, power and phase) beam angle, beam width and radiation resistance.
12.4 Types of antennas-Brief description, characteristics and typical applications of medium wave antenna, shortwave antenna, HF antenna, VHF, UHF and Microwave antenna e.g., half wave dipole, ground plane, yagi and ferrit rod antenna in transistor receiver.Brief idea about Rhombic antenna, dish antenna, Horn, Parabolic reflector and Lens antenna.

12.5 Antenna arrays-Brief description of broad side and end fire arrays, their radiation pattern and application (without analysis);

12.6 Basic idea about different modes of radio wave propagation-ground wave propagation, space wave propagation and sky wave propagation, their characteristics and typical areas of application. (e.g. medium wave, short wave,TV communication.)

12.7 Explanation of the terms-critical frequency, maximum usable frequency (MUF) and skip distance.

13.Communication Media:- Telephone Lines, Twisted Pair Wire, Co-axial Cable, Fibre optics.

14. Modems - Basic working principle of modems and their application

15. Multiplexers- Dightal Multiplexers- Synchronous and synchronous(Brief Idea Only).

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II Year IV Semester

DPRINEC404

PRINCIPLE OF DIGITAL ELECTRONICS

(L-T-P-4-0-0)

DETAILED CONTENTS

1. INTRODUCTION TO DIGITAL ELECTRONICS:

1.1 Basic difference between analog and digital signal.
1.2 Application and advantages of digital signal processing.

1. NUMBER SYSTEM:

2.1 Binary, Octal and Hexadecimal number system; conversion from decimal octal and hexadecimal to binary and vice-versa.
2.2 Binary addition, substraction, multiplication and division including binary points.
2.3 1's and 2's complements methoof substraction.

2. CODES, CODE CONVERSION AND PARITY:

3.1 The 8421 and excess-3 codes; mention of other populer BCD codes.
3.2 Addition of 8421, BCD coded numbers its limitations and excess-3 coded numbers.
3.3 Gray code, Gray to binary conversion and vice-versa.
3.4 Basic concept of parity, single and double parity and error detection.

1. LOGIC GATES:

1.1 Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates.
1.2 Concept of negative and positive logic.

2. LOGIC SIMPLIFICATIONS

2.1 Boolean algebra, Karnaugh-mapping (upto 4 varibles) and simple application in developing combinational logic circuits.
2.2 Implementation of logic equations with gates.
2.3 Use of NAND and NOR gates as universal gates.

3. LOGIC FAMILIES AND DIGITAL ICS:

3.1 Logic family classification :
(a) Definition of SSI, MSI, LSI, VLSI.
(b) Bipolar Logic, Diode Logic, Transistor Logic Intverter,TTL logic, MOS,CMOS logic, logic ECL
(c) Sub-classification of TTL and MOS logic families.
(d) Characteristics of TTL and MOS Digital gates delay, speed of noise margin, logic levels, power dissipation, FAN-IN, FAN-OUT, power supply requirements and comparison between TTL and MOS ICs.

3.2 Logic Circuits :
(a) Open collector and to temples output circuit operation for a standard

TTL, NAND gate.
(b) MOS circuit operation for a standard gate (NOR).

3.3 Tristate Switch : Normally open and normally closed switch.

3.4Familiarization with commercial digital IC gates, Their number identification and Pin configuration.

4. ARITHMETIC OPERATIONS:

4.1 Design of Exclusive Or, Half adder and Half subtractor.
4.2 Design of Full adder circuits and its operation.
4.3 Design of Full subtractor circuits and its operation.
4.4 Some examples (circuits) of code convertors.

5. ENCODER, DECODERS & DISPLAY DEVICES ASSOCIATED CIRCUITS:

5.1 LED, LCD, seven segment display, basic operation of various commonly used types.
5.2 Four Decoder circuits for 7 segment display.
5.3 Basic decimal to BCD encoder circuits.
5.4 Use of decoders/driver ICs with reference to commercial ICs.
5.5 Basic Multiplexer and Demultiplexer

6. FLIP FLOPS:

6.1 Operation using waveforms and truth tables of following flip flops. RS, T, ST, D, JK, Master/Slave JK Flip Flops mention of commonly used ICs Flip flops.

7. COUNTERS:

7.1 Counters classification.
7.2 Binary and decade counters.
7.3 Divide by N counters.
7.4 Programmable asynchronous counters.
7.5 Down counters up/down counter operations.
7.6 Presettable asynchronous counters.
7.7 Difference between asynchronous and synchronous counters.
7.8 Ring counters with timing diagram.
7.9 Familiarization with commerical TTL/CMOS counter ICs.

8. SHIFT REGISTERS:

8.1 Introduction and Basic concepts including shift left and shift right.
8.2 Serial in serial out.
Serial in parallel out.
Parallel in serial out.
Parallel in parallel out.
8.3 Universal shift register.
8.4 Familiarisation with common TTL/CMOS ICs.
8.5 Buffer register, Tristate Buffer Register.

9. MEMORIES:

9.1 Classification according to the following heads.
(a) Volatile and non-volatile memories.
(b) Random access memories and sequential access.
(c) Semiconductor and non-semiconductor memories.
(d) Destructive and non-destructive memories.

9.2 Semi-conductor ROMs, PROMs, EPROM, SRAM, DRAM, Basic structure and working of CCD, R/W memory.

10. A/D AND D/A CONVERTERS:

10.1 Use of A/D and D/A converters.
10.2 Binary resister network R-2R network.
10.3 D/A converter using R-2R.
10.4 UP, UP/Down counter type A/D converter.
10.5 Successive approximation.
10.6 Basic concepts of parrallel A/D converter.
10.7 Two bit A/D converter.

11. ARITHMETIC CIRCUITS:

Ideas About
11.1 Basic Arithmetic logic units applications.
11.2 Block diagram explanation of binary multiplier circuit.

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II Year IVSemester

DPROGEC405
PROGRAMMING IN C & C++ LAB

(L-T-P-0-0-2)

(Common to Instrumentation & Control Engg.)

List of Experiments

1. Exercises involving output and input format controls in Pascal.
2. Exercises involving control transfer statements in C & C++
3. Exercises with arrays & Pointers in C & C++.
4. Exercises with functions in C & C++.
5. Exercises with files in C & C++.

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II Year IV Semester

DNETWEC406
NETWORKS, FILTERS & TRANSMISSION LINES- LAB

(L-T-P-0-0-2)

(Common with Instrumentation & Control Engineering)

List Of Experiment

1. Experimental verifications of the Thevenin's and Norton's theorem with an a.c. source.
2. Experimental verifications maximum power transfer theorem.
3. To measure the characteristics impedance of a symetrical T/n (pi) network.
4. To measure the image impedance of a given asymmetrical T/n (pi) networks.
5. To design and measure the attenuation of a symmetrical T/n(pi) type attenuator.
6. For a prototype low pass filter :
   (a) Determine the characteristics impedance experimentally.
   (b) Plot the attenuation characteristics.
7. For a prototype high pass filter :
   (a) Determin the characteristics impedance experimentally.
   (b) To plot the attenuation characteristic.
8. (a) To plot the impedance characteristic of a prototype band pass filter.
   (b) To plot the attenuation characteristic of a prototype band pass filter.
9. (a) To plot the impedance characteristic of m-derived low pass filter.
   (b) To plot the attenuation characteristic of a m-derived high pass filter.
10. To design Ist order and IInd order active LPF filter using IC 741 and draw the frequency response curve.
11. To design Ist order and IInd order active HPF filter using IC 741 and draw the frequency response curve.
12. Measurement of characteristics of a short transmission line.
13. Measurement of L & C of lossless transmission line.
14. Measurement of Zo of lossless transmission line.
15. Measurement of Attenuation of lossless transmission line.
16. Measurement of Velocity of Propagation in lossless transmission line.

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II Year IV Semester

DPRINEC407

PRINCIPLES OF COMMUNICATION ENGG.

(L-T-P-0-0-2)

List Of Experiments

1. (a) To observe an AM wave on CRO produced by a standard signal generator using internal and external modulation.
   (b) To measure the modulation index of the wave obtained in above experiment.
2. (a) To obtain an AM wave from a collector modulator circuit and observe the Am pattern on CRO.
   (b) To measure index of modulation of the AM signal for different level of modulation signal.
3. To obtain a FM wave from reactance tube modulator/voltage controlled oscillator (using 8038 of 566) circuit and measure the frequency deviation for different modulating signal.
4. To obtain modulating signal from an AM detector circuit and observe the pattern for different RC time constants and obtain its optimum value for least distortion.
5. To obtain modulating signal from a FM detector (Foster-seely/ Ratio detector/quadrature detector) Circuit (or using 2211 or PLL 565) and plot the detector characteristics.
6. To obtain AM-SB from Balanced modulator.(BM025 may be used).
7. To detect AM-SB by using SSB detector. (SL 640C may be used).
8. To identifying different stages of radio receiver and IC used at each stage and plot the sensitivity characteristics of a radio receiver and determination of the frequency for maximum sensitivity.
9. To plot the selectivity characteristics of a radio receiver.
10. To plot the fidelity characteristics of a radio receiver.
11. (a) To plot the radiation pattern of directional and Omni directional antenna.
    (b) To plot the variation of field strength of radiated wave, with distance from a transmitting antenna.
12. Tuning and alignement of radio receiver.
13. Circuit tracing and fault finding of different stages of radio receiver.
14. Simple demonstration, ASK, FSK and PSK through training kits

NOTE :- Antenna simulator developed by TTTI can be used for this experiment.

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II Year IV Semester

DPRINEC408
PRINCIPLE OF DIGITAL ELECTRONICS-LAB

(L-T-P-0-0-2)

List Of Experiments

1. Do atleast 20 experiments familiarzation with bread-board.
   Familiarzation With TTL And MOS ICs.
2. Identification of Ic-nos, Pin-nos, Ic types.
3. To observe that logic low and logic high do not have same voltage value in input and output of logic gate.
4. To observe the propagation delay of TTL logic gate.
5. Observation of the difference between MOS and TTL gates under the following heads
   (a) Logic levels.
   (b) Operating voltages.
   (c) Propagation delay.

Display Devices And Associated Circuits.

6. Familiarisation and use different types of LEDs common anode and common cathode seven segment display.
7. Use of 7447 BCD to 7-segment decoder.

Logic Gates.

8. Verification of truth table for 2 Input NOT, AND, OR, NAND, NOR, XOR Gates.
   Design And Implementation Of Simple Logic Circuits.
9. To construct a 4-bit even/odd parity generator/checker using XOR gates and to verify their truth tables.
10. To construct half adder and half subtractor using XOR and NAND gates verification of their truth tables.
11. To construct a full adder circuit with XOR and NAND gates.
12. (a) Study of 3 bit adder circuit implemented with or and NAND gates.
    (b) To construct 4 bit adder and full subtractor using full

adder chip 7480 and NAND gates.

13. (a) To verify the truth table of 4 bit adder IC chip 7483.

(b) To construct the 4 bit adder/2's complement subtractor using 7483 and NAND gates.

Flip Flops.

14. To verify the truth table for selected positive edge triggered and negative edge triggered F/F of J-K and D type.

Counters

15. To construct and verify truth table for asynchronous binary and decade using J-K flip flops.

16. (a) To construct divice by 60 counter using ripple.
(b) To use counter IC chip 7493 in the divide by eight mode and divide by sixteen mode.
(c) To construct a divide by 100 counter using CMOS.

17. To construct a divide by 60 counters using synchronous counter IC chips.

Registers.

18. To construct a 4 bit buffer register using 4 bit register IC chip.
19. To construct a 4 bit universal shift register using flip flops.
20. To use a 4035 B universal shift register.

Multiplexers And Demultiplexers.

21. To decode a 3 line to 8 line encode from 8 line to 3 line and to observe inputs and outputs.
22. Single plus to 16 line decoder and observation output after a 16 to 4 line encoder.
23. To use ALU chip for selected arithmatic and logic operatio