CURRICULUM

FOR

DIPLOMA PROGRAMME

IN

Electronics & Communication Engineering

2nd Year (i.e. 3rd & 4th Semester)

FOR THE STATE OF HIMACHAL PRADESH

Implemented w.e.f. Session 2013-14

(Implemented w.e.f. Session 2013-14)

Prepared by:-
Composite Curriculum Development Centre
Directorate of Technical Education,
Vocational & Industrial Training, Sundernagar(H.P.)

CONTENTS

THIRD SEMESTER

FORTH SEMESTER

PREFACE

India, in last two decades, has made significant progress in all major spheres of activity. Since 1947, the Technical Education System has grown into fairly large sized system, offering opportunities for education and training in vide variety of trades / disciplines at different levels. Needless to say that well trained technical manpower is the backbone of any growing economy in the era of fast industrialization. It has been the endeavor of the Technical Education Department to take decisive steps to enhance the capacities of technical institutions with major emphasis on quality and excellence in technical education .Our country is the only country in the world which has 50% population below the age of 25 years whereas America has 30% and China 40%.Working Age Population (WAP) is increasing in India whereas it is decreasing in other parts in the world. Challenge before us is to train this WAP for the world of work .Updated curriculum is one of the most powerful tools to improve the quality of training.

Curriculum Document is a comprehensive plan or a blue print for developing various curriculum materials and implementing given educational programme to achieve desired and formally pre-stated educational objectives. Moreover it (the document) is the output of exhaustive process of curriculum planning and design, undertaken by the implementers under the expert guidance of curriculum designer.

While working out the detailed contents and study and evaluation scheme, the following important elements have been kept in mind:

i) Major employment opportunities of the diploma holders.
ii) Modified competency profile of the diploma holders with a view to meet the changing needs due to technological advancement and requirements of various employment sectors.
iii) Vertical and horizontal mobility of diploma pass outs for their professional growth.
iv) Pragmatic approach in implementing all the curricula of diploma programmes in engineering and technology in the state of H.P.

The document is an outcome of the feedback received from field organizations/ industry of different categories viz. small, medium and large scale which offer wage employment for the diploma pass outs. In every stage of planning and designing of this curriculum, suggestions and advice of experts representing industry, institutions of higher learning, research organizations etc. were sought and incorporated as per the requirement of curriculum . The document contains the study and evaluation scheme and detailed subject/course contents to enable the H.P. Polytechnics to implement revised curriculum and to achieve the desired objectives.

Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which Communication Lab has been introduced during the first year itself.

We hope that this revision will prove useful in producing competent diploma holders in the state of Himachal Pradesh. The success of this curriculum depends upon its effective implementation and it is expected that the managers of polytechnic education system in Himachal Pradesh will make efforts to create better facilities, develop linkages with the world of work and foster conducive and requisite learning environment.

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Sundernagar, Himachal Pradesh.

2nd YEAR OF THREE YEAR DIPLOMA PROGRAMME IN CIVIL ENGINEERING

1. SALIENT FEATURES

1) Name of the Programme : Three year Diploma Programme Electronics & Comm. Engineering
2) Duration of the Programme : Three years (06 Semesters)
3) Entry Qualification : As prescribed by H.P. Takniki Shiksha Board
4) Intake : As approved by H.P. Takniki Shiksha Board
5) Pattern of the Programme : Semester Pattern
6) Curriculum for : 1st year of Three year Diploma Programme(Technical Stream)
7) **Student Centred Activities:**

A provision of 2-4 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. These activities will comprise of co-curricular & other activities such as expert lectures, games, seminars, declamation contests, educational field visits, NCC, NSS and cultural activities & hobby classes like photography, painting, singing etc.

8) **Industrial Training:-**

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of a minimum of 4 weeks duration to be organised during the semester break starting after second year i.e. after IV Semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 50 and external assessment of 50 marks have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry.

Teachers and students are requested to see the footnote below the study and evaluation scheme of IV Semester for further details.

2. GUIDELINES

2.1 GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

Distribution of 25 marks for SCA will be as follows:

i. 5 Marks shall be given for general behaviour

ii. 5 Marks for attendance shall be based on the following distribution:

1.	Less than 75%	Nil
2.	75-79.9%	3 Marks
3.	80-84.9%	4 Marks
4.	Above 85%	5 Marks

iii. 15 Marks shall be given for the Sports/NCC/Cultural and Co-curricular activities/other activities after due consideration to the following points:

1. For participation in sports/NCC/Cultural/Co-curricular activities at National or above level, shall be rewarded with minimum of 10 marks
2. For participation in sports/NCC/Cultural/Co-curricular activities at Inter-polytechnic level, shall be rewarded with minimum of 08 marks
3. For participation in two or more of the listed activities, 5 extra marks should be rewarded

Note: *Head of Department shall ensure that these marks are conveyed to the H.P. Takniki Shiksha Board, Dharamsala at the end of semester along with sessional record.*

2.2 GUIDELINES FOR SESSIONAL ASSESSMENT

- The distribution of marks for Internal Assessment in theory subjects and drawing shall be made as per the following guidelines:
  i. 60% of internal assessment shall be based on the performance in the tests. At least three tests shall be conducted during the semester out of which at least one should be house test. 30% weightage shall be given to house test and 30% to class test(One best out of two).
  ii. 20% marks shall be given to home assignments, class assignments, seminars etc.
  iii. 20% marks shall be given for attendance/punctuality in the subject concerned.
- The distribution of marks for Internal/External Assessment in practical subjects shall be made as per the following guidelines:
  i. 60% marks shall be awarded for performance in practical.
  ii. 20% marks shall be given for Report/Practical book and punctuality in equal proportion.
  iii. 20% marks shall be for Viva-voce conducted during the practicals.
- The distribution of mark for internal assessment in drawing subjects shall be as per following guidelines:-

(i) 60% marks for sheets (ii.) 40% for tests.

STUDY AND EVALUATION SCHEME

THIRD SEMESTER ELECTRONICS & COMMUNICATION ENGINEERING

SR. NO.	SUBJECTS	STUDY SCHEME Hrs/Week		MARKS IN EVALUATION SCHEME								Total Marks
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	**Pr**	*Th*	**Pr**	**Total**	**Th**	**Hrs**	**Pr**	**Hrs**	**Total**	
3.1	Network Filters and Transmission Lines	4	2	30	20	50	100	3	50	3	150	200
3.2	Electronic Components and Materials	4	-	50	-	50	100	3	-	-	100	150
3.3	*Computer Programming and Applications	3	4	30	20	50	100	3	50	3	150	200
3.4	*Electronic Devices and Circuits-I	5	2	30	20	50	100	3	50	3	150	200
3.5	**Digital Electronics	4	2	30	20	50	100	3	50	3	150	200
3.6	Principles of Communication Engineering	4	2	30	20	50	100	3	50	3	150	200
3.7	Advanced Electronic Workshop	-	2	-	50	50	-	-	50	3	50	100
#Student Centred Activities		-	2	-	25	25	-	-	-	-	-	25
Total		24	16	200	150	375	600	18	300	18	900	1250

* *Common with 3rd sem. Electrical Engg. $ Common with 3rd sem. Electronics & Comm. Engg.*

FOURTH SEMESTER ELECTRONICS & COMMUNICATION ENGINEERING

SR. NO.	SUBJECTS	STUDY SCHEME Hrs/Week		MARKS IN EVALUATION SCHEME								Total Marks
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	**Pr**	**Th**	**Pr**	**Total**	**Th**	**Hrs**	**Pr**	**Hrs**	**Total**	
4.1	*Electronic Devices and Circuits-II	4	2	30	20	50	100	3	50	3	150	200
4.2	Electronic Instruments and Measurements	4	2	30	20	50	100	3	50	3	150	200
4.3	* * Microprocessor and Programming	4	2	30	20	50	100	3	50	3	150	200
4.4	Power Electronics	4	2	30	20	50	100	3	50	3	150	200
4.5	Communication Systems-I	4	2	30	20	50	100	3	50	3	150	200
4.6	Troubleshooting of Electronics Equipments	4	2	30	20	50	100	3	50	3	150	200
#Student Centred Activities		-	4	-	25	25	-	-	-	-	-	25
Total		24	16	180	145	325	600	18	300	18	900	1225

* *Common with 4th Sem. Electrical & Electronics Engg.,*

** *Common with 4th Sem. Computer Engg.,*

Detailed Contents
Of
Electronics & Communication Engineering
3rd & 4th Semester Subjects

3.1 NETWORK FILTERS AND TRANSMISSION LINES

L T P
4 - 2

RATIONALE

The Study of networks, filters and transmission lines leads to understanding of line communication, audio and video communication, and microwave communication. Particularly the study of networks takes of from principles of a.c. theory and introduces the student to parameters and characteristics of various networks, including filters. Also the study of transmission lines becomes important as its analogy is used in study of transmission of plane electromagnetic waves in bounded media.

DETAILED CONTENTS

1. Networks (20 hrs)

1.1 Two port (four terminals) network: Basic concepts of the following terms:- Symmetrical and asymmetrical networks: Balanced and unbalanced network; T-network, π network, Ladder network; Lattice network; L-network and Bridge T-network

1.2 Symmetrical Network:- Concept and significance of the terms characteristic impedance, propagation constant, attenuation constant, phase shift constant and insertion loss; - T-network; π Network

1.3 Asymmetrical Network- Concept and significance of iterative impedance, image Impedance, Image transfer constant and insertion loss.

2. Attenuators (08 hrs)

2.1 Units of attenuation (Decibels and Nepers): General characteristics of attenuators.

2.2 Analysis and design of simple attenuator of following types; Symmetrical T and π type.

3. Filters (20 hrs)

3.1 Brief idea of the use of filter networks in different communication systems, Concept of low pass, high pass, band pass and band stop filters.

3.2 Analysis of prototype Low and High pass(Tand π) filter .

3.3 -Impedance characteristics v/s frequency characteristics of a low and high pass filter and their significance.

3.4 -Attenuation vs frequency; Phase shift vs frequency, Characteristics impedance vs frequency of T and π Low and High pass filters and their significance.

3.5 -Simple design problems of prototype low & high pass section.

3.6 Limitation of prototype filters, need of m-derived filters. Brief idea of m- derived Low and High filter (Tand π) section.

3.7 Crystal Filters; Crystal and its equivalent circuit. Special properties of piezoelectric filters and their use.

3.8 Active Filters; Basic concept of active filters and their comparison with passive filters. Basic idea of Butterworth filter.

4. Transmission Lines (16 hrs)

4.1 Transmission Lines, their types and applications.

4.2 Distributed constants, T and π representation of transmission line section.

4.3 Definition of characteristic impedance, propagation constant, attenuation

constant and phase shift constant.

4.4 Concept of infinite line.

4.5 Condition for minimum distortion and minimum attenuation of signal on the- line and introduction to loading methods.

4.6 Concept of reflection and standing waves, definition of reflection coefficient, SWR & VSWR and their relation (no derivation).

4.7 Concept of transmission lines at high frequencies.

4.8 Introduction to stubs. (Single, open and short stubs).

LIST OF PRACTICALS

1. To measure the characteristic impedance of symmetrical T and Πnetworks.
2. To measure the image impedance of a given asymmetrical T and Πnetworks.
3. To design and measure the attenuation of a symmetrical T/ Πtype attenuator.
4. For a prototype low pass filter:
   a) Determine the characteristic impedance experimentally
   b) Plot the attenuation characteristic
5. For a prototype high pass filter:
   a) Determine the characteristic impedance experimentally
   b) To plot the attenuation characteristic
6. a) To plot the Impedance characteristic of a prototype band-pass filter
   b) To plot the attenuation characteristic of a prototype band pass filter
7. a) To plot the impedance characteristic of m- derived low pass filter
   b) To plot the attenuation characteristics of m-derived high pass filter
8. To observe standing waves on a transmission line and measurement of SWR and characteristic impedance of the line.

RECOMMENDED BOOKS

1) *Network Lines and Fields by John D Ryder; Prentice Hall of India, New Delhi*
2) *Network Filters and Transmission Lines by AK Chakarvorty; Dhanpat Rai & Co. Publication, New Delhi*
3) *Network Analysis by Van Valkenbury: Prentice Hall of India, New Delhi*
4) *Network Analysis by Soni and Gupta; Dhanpat Rai & Co. Publication, New Delhi*
5) *Network Theory and Filter Design by Vasudev K. Aatre*
6) *Network Filters and Transmission line by Umesh Sinha*
7) *Electrical & Electronics Measuring instrumentation , A.K Sawhney, Dhanpat Rai & Co. Publication, New Delhi*
8) *Network Analysis , G.K. Mithal*
9) *Network Filters and Transmission line by Nardeep Goyal, Rajneesh Kumari, Tech. Max Publication, Pune.*

SUGGESTIVE DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Networks	20	30
2	Attenuators	08	15
3	Filters	20	30
4	Transmission Lines	16	25
Total		**64**	**100**

3.2 ELECTRONIC COMPONENTS AND MATERIALS

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RATIONALE

Study of Electronic components and Materials is important from point of view of manufacturing, testing and maintenance of electronic devices and systems. Students should understand the procedure of identification, characteristics, specifications, merits, limitations, and applications of electronic components and materials. This subject will enable the students to understand various types of materials, their characteristics and components used in electronic systems.

DETAILED CONTENTS

1. Materials (32 hrs)

1.1 Classification of materials: Conducting, semi-conducting and insulating materials through a brief reference to their atomic structure.

1.2 Conducting Materials: Resistivity and factors affecting resistivity. Classification of conducting materials into low resistivity and high resistivity materials.

1.3 Insulating Materials:

- Electrical properties: Volume resistivity, surface resistance, dielectric loss, dielectric strength (breakdown voltage) and dielectric constant.

-Thermal properties: Heat resistance, classification according to temperature endurance, thermal conductivity.

- Brief introduction of the following materials and their applications. Mica, Paper, Asbestos, Ceramic, Teflon, Acrylics, Silicon grease, Bakelite, Epoxy Glass, Soldering Lead alloy.

1.4 Magnetic Materials: Different Magnetic materials; (Dia, Para, Ferro) and their properties. Ferro magnetism, Domains, permeability, Hysteresis loop. Soft and hard, magnetic materials, their examples and typical applications.

1.5 Latest developments in Materials: Idea about latest materials in the light of technological advancements like hybrid carbon, advanced ceramic , and liquid crystals.

2. Components (32 hrs)

2.1 Capacitors:

a) Concept of capacitance and capacitors, units of capacitance, types of capacitors, constructional details and testing specifications.

b) Capacity of parallel plate capacitors, spherical capacitors, cylindrical capacitor.

c) Energy stored in a capacitor.

d) Concept of dielectric and its effects on capacitance, di-electric constant, break down voltage.

2.2 Resistors: Carbon film, metal film, carbon composition, wound and variable types (presets and potentiometers).

2.3 Transformer, inductors and RF coils: Methods of manufacture, testing, Need of shielding, application and trouble shooting.

2.4 Surface Mounted Devices (SMDs): Constructional details and specifications.

2.5 Connectors, Relays, switches and cables: Different types of connectors, relays, switches and cables, their symbols, specifications, construction, types, applications and their testing.

2.6 Semi Conductors and Integrated Circuits: Basic characteristics of Semiconductor materials, diodes, transistors, FETs, and SCRs. Various processes in IC manufacturing. Superconductivity and piezoelectric ceramic transducer elements.

RECOMMENDED BOOKS

1. *Electronic components and Materials by Grover and Jamwal; Dhanpat Rai and Sons, New Delhi*
2. *Basic Electronics and Linear Circuits by NN Bhargava and Kulshreshta; Tata McGraw Hill, New Delhi*
3. *Electronic components and Materials by SM Dhir, Tata McGraw Hill, New Delhi*
4. *Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi*
5. *Electronic Engineering Materials by ML Gupta, Dhanpat Rai and Sons; New Delhi.*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Materials	32	50
2	Components	32	50
Total		**64**	**100**

3.3 COMPUTER PROGRAMMING AND APPLICATIONS

L T P
3 - 4

RATIONALE

Computer plays a very vital role in present day life, more so, in the professional life of Diploma engineers. In order to enable the students use the computers efectively in problem solving, this course ofers the modern programming language C along with exposure to various engineering applications of computers. The knowledge of C language will be reinforced by the practical exercises and demonstration of application software in the field of Electrical Engineering during the course of study. Introduction to data base management system is also a very significant field with vast employment potential.

1. Algorithm and Program Development (8 hrs)

1.1 Steps in development of a program.

1.2 Flow-charts, algorithm development.

1.3 Introduction to various computer languages.

1.4 Concept of interpreter, compiler, high level language(HLL), machine language (ML) and Assembly Language.

2. Program Structure (C Programming) (30 hrs)

2.1 History of 'C', data types, input output statements, arithmetic and logical operations, data assignments, precedence and associatively.

2.2 I/O statements: Assignment, Variables, arithmetic operation- their precedence, data types standard I/O function, formulated I/O.

2.3 Control Statements: Logical and relational operators; if-else, while, do- while, for loops, breaks, switch statements.

2.4 Functions: Function declaration, parameter passing- by value, storage classes (Local, Global and Static variables, standard library functions.

2.5 Arrays: Single and multi-dimensional arrays, character arrays.

2.6 Pointers: To various data types, pointers in parameters passing, pointers to function.

2.7 Structures: Definition of a structure, pointer to structure, union and array of structure.

2.8 Strings: String processing, functions and standard library function.

2.9 Data files: File handling and manipulation, file reading and writing.

3. Software Applications in Electronics Engineering (10 hrs)

Computer application overview through various applications software related to Electronics Engineering branch viz: ORCAD, H spice, KEIL, Circuit Maker, MATLAB, Electronic Workbench, etc.

LIST OF PRACTICAL:

1. Programming exercise on executing a C Programs.
2. Programming exercise on editing a C program.
3. Programming exercise on defining variables and assigning values to variables.
4. Programming exercise on arithmetic and relation operators.
5. Programming exercise on arithmetic expressions and their evaluation.
6. Programming exercise on reading a character.
7. Programming exercise on writing a character.
8. Programming exercise on formatting input using print.
9. Programming exercise on formatting output using scan.
10. Programming exercise on simple IF statement.
11. Programming exercise on IF… ELSE statement.
12. Programming exercise on SWITCH statement.
13. Programming exercise on GOTO statement.
14. Programming exercise on DO-WHILE statement.
15. Programming exercise on FOR statement.
16. Programming exercise on one dimensional array.
17. Programming exercise on two dimensional array.

INSTRUCTIONAL STRATEGY

This course is a highly practical and C. self- study oriented courses. The teachers are expected to explain the theoretical part and ensure that the students execute and debug different programs. The PC needed to have either Turbo C.

RECOMMENDED BOOKS

1. *Programming in C by Schaum series McGraw Hill*

2. *Programming in C by Kerning Lan and Richie; Prentice Hall of India, NewDelhi*

3. *Programming in C by Balaguru Swamy, Tata McGraw Hill, New Delhi.*
4. *Let us C- Yashwant Kanetkar, BPB Publications, New Delhi*
5. *Vijay Mukhi Series for C and C++*
6. *Programming in C by R Subburaj, Vikas Publishhing House Pvt. Ltd., Jangpura, New Delhi*
7. *Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi*
8. *Programming in C by BP Mahapatra, Khanna Publishers, New Delhi*
9. *Elements of C by MH Lewin, Khanna Publishers, New Delhi*
10. *The Complete Reference to Visual Basic 6, by Noel Jerke, Tata McGraw Hill, New Delhi*
11. *Pointers in C by Yashwant Kanetkar, BPB Publishers New Delhi*
12. *Programming in Applications by Chandershekhar, Unique International Publications, Jalandhar*
13. *The essentials of Computer Organizing and Architecture by Linda Null and Julia Labur, Narosa Publishing House Pvt. Ltd., New Delhi*
14. *Web sitewww.Beyondlogic.org*

SUGGESTIVE DISTRIBUTION OF MARKS

Topic No.	Topic	Time Allotted (H rs)	Marks Allocation
1.	Algorithm and Program Development	4	15
2.	Program Structure (C Programming)	24	70
3.	Software Applications	4	15
Total		**32**	**100**

3.4 ELECTRONIC DEVICES AND CIRCUITS-I

L T P

5 - 2

RATIONALE

Having attained basic knowledge of electronic devices like diodes, transistors, and elementary circuits, in second semester, this course will enable the students to learn about the use of transistors in analog circuits like voltage amplifier, power amplifier, multistage amplifier, tuned amplifiers, oscillators, etc. It also gives information about FET, MOSFETs, C-MOS and their applications for effective functioning in the field of electronic service industry.

1. **Current and voltage sources** (3 hrs)
   - 1.1 Concept of current and voltage sources, constant voltage and current sources, their graphical representation.
   - 1.2 Conversion of voltage source into current source and vice-versa.
   - 1.3 Difference between actual voltage source and constant voltage source
2. **Transistor as an amplifier:** (07 hrs)
   - 2.1 Three regions of operation- cutoff, active, saturation.
   - 2.2 Practical way of representing CE circuit.
   - 2.3 Different ways of taking output from CE transistor amplifier.
   - 2.4 Transistor as an amplifier in CE Configurations, Concept of DC load line and Operating point.
   - 2.5 Performance characteristics of transistor amplifier i.e. input resistance, output resistance, effective collector load, current gain, voltage gain & power gain.
3. **Transistor biasing circuits:** (08 hrs)
   - 3.1 Concept of transistor biasing and selection of operating point.
   - 3.2 Need for stabilization of operating point.
   - 3.3 Methods of transistor biasing i.e. Base resistor, Collector feedback & Voltage divider biasing circuits, their respective stability factor.
4. **Single stage transistor amplifier:** (8 hrs)
   - 4.1 Single stage transistor amplifier circuit.
   - 4.2 Explanation of phase reversal of output voltage with respect to input voltage and its graphical demonstration.
   - 4.3 ac load line and its use in calculation of current and voltage gain of a single stage CE amplifier circuit.
   - 4.4 h- Parameters and their significance.
5. **Field effect transistors** (08 hrs)
   - 5.1 Construction, operation and characteristics of FET,FET amplifier circuit.
   - 5.2 Construction, operation and characteristics of MOSFET in depletion and enhancement modes.
   - 5.3 C MOS - advantages and applications

5.4 Comparison of FET, MOSFET and BJT

6. **Multistage Amplifiers** (10 hrs)

6.1 Need for multistage amplifier.
6.2 Gain of multistage amplifier.
6.3 Different types of multistage amplifier like RC coupled, Transformer coupled, Direct coupled amplifier, their frequency response, bandwidth and applications.

7. **Large Signal Amplifier** (10 hrs)

7.1 Difference between voltage and power amplifiers.

7.2 Importance of impedance matching in amplifiers.

7.3 Class A, Class B, Class AB, and Class C amplifiers, collector efficiency and Distortion in class A, B & C amplifiers.

7.4 Single ended power amplifier.

7.5 heat dissipation curve and importance of heat sinks.

7.6 Push-Pull Amplifier. operation of class- B push-pull amplifier.

7.7 Complementary symmetry push-pull amplifier.

8. **Feedback in Amplifiers** (10 hrs)

8.1 Basic principles and types of feedback.
8.2 Derivation of expression for gain of an amplifier employing negative feedback.
8.3 Effect of negative feedback on gain, gain stability, distortion, frequency response, bandwidth and input & output impedance of an amplifier.
8.4 Use of negative feedback in the following circuits:
- RC coupled amplifier without emitter bypass capacitor.
- Emitter follower and its application.

9. **Sinusoidal Oscillators** (10 hrs)

9.1 Use of positive feedback.
9.2 Barkhausen criterion for oscillations.
9.3 Different oscillator circuits - tuned collector, Hartley, Colpitts, Phase shift, Wien Bridge, and Crystal oscillator. Their working principles (no mathematical derivation)

10. **Tuned Voltage Amplifiers** (06 hrs)

10.1 Series and parallel resonant circuits and bandwidth of resonant circuits.

10.2 Single and double tuned voltage amplifiers and their frequency response characteristics.

LIST OF PRACTICAL:-

1. To plot input and output characteristics of transistor in CE configuration. Calculate input and output resistance and voltage gain.
2. To measure the voltage gain of two stage RC coupled amplifier.
3. To plot the frequency response of two stage RC coupled or transformer coupled amplifier & calculate the bandwidth.
4. To measure the power gain of push-pull amplifier at 1KHz.
5. To measure the voltage gain of emitter follower circuit and plot its frequency response.

6. Plot the frequency response curve of Hartley or Colpitts Oscillator.
7. Plot the frequency response curve of Phase shift Oscillator.
8. Plot V-I characteristics of FET amplifier.

LIST OF RECOMMENDED BOOKS

1) *Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hills, New Delhi Electronic Principles by Sahdev, Dhanpat Rai and Sons, New Delhi.*
2) *Electronics Principles by Malvino, Tata McGraw Hills, New Delhi*
3) *Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi Electronics Devices and Circuits by Bhupinderjit Kaur,modern Publishers, Jalandhar Basic Electronics by Grob, Tata McGraw Hills, New Delhi*
4) *Art of Electronics by Horowitz*
5) *Electronic Circuit Theory by Boylstead*
6) *Electronic Devices and Circuits by BL Theraja, S Chand and Co Ltd. New Delhi Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd.,New Delhi*
7) *Electronics Devices and Circuits-I by Naresh Gupta, Jyotesh Malhotra and Harish C.*
8) *Saini, Eagle Prakashan, Jalandhar*

SUGGESTED DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Current and voltage sources	03	5
2	Transistor as an amplifier	07	10
3	Transistor biasing circuits	08	10
4	Single stage transistor amplifier	08	10
5	Field effect transistors	08	10
6	Multistage Amplifiers	10	15
7	Large Signal Amplifier	10	10
8	Feedback in Amplifiers	10	10
9	Sinusoidal Oscillators	10	10
10	Tuned Voltage Amplifiers	06	10
Total		**80**	**100**

3.5 DIGITAL ELECTRONICS

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Rationale:-

To study different logic families. To introduce different logic gates, their Boolean algebra and combinational logic design using those gates. To learn how to design sequential logic using flip flop. After this course the student will be able to design simple logic circuits, assemble logic circuits, test the logic circuits, observe outputs of logic circuits and troubleshoot digital circuits

Pre-Requisite -

1. Basic Electronics Engineering

DETAILED CONTENTS

1. Introduction To Digital Techniques 10 hrs

Digital circuit., Digital signal, Use of digital circuit and digital signal, Advantages and Disadvantages of Digital circuits, Number System - Introduction to Binary, Octal, Decimal, Hexadecimal number system. Conversion of number systems, 1's complement and 2's complement, Binary arithmetic (addition, subtraction). BCD code, BCD arithmetic (addition, subtraction).
Introduction to A/D and D/A Converters.

2. Logic Gates And Boolean Algebra 09 hrs

Logical symbol, logical expression and truth table of AND, OR, NOT, NAND, NOR, EX- OR and EX-NOR gates, Universal gates – NAND and NOR gate, Logical circuits of basic gates using universal gates, Basic laws of Boolean algebra, Duality theorem, De Morgan's theorems.

3. Combinational Logic Design / Circuits 16 hrs

Simplification of Boolean expression using Boolean algebra. Construction of logical circuits forms Boolean expressions. Boolean expressions using Sum of products and product of sums forms. K-map representation of logical functions. Minimization of logical expressions using K-map (2, 3, 4 variables). Standardization of SOP & POS equations. Concept of Adders / Subtractors. Truth table, K-map, Simplified logical expression and logical circuit using basic gates and universal gates of:

(a) Half adder and full adder.
(b) Half subtractor and full subtractor.

Block diagram, Truth table, Logical expression and logic diagram of Multiplexers (4:1 and 8:1), Multiplexer IC. Block diagram and Truth table of Demultiplexer (1:4; 1:8; 1:16), Demultiplexer IC. Block diagram, Truth table, working principle of Encoders & Decoders

4. Flip Flops And Sequential Logic Design 24 hrs

One-bit memory cell, clock signal, Symbol and Logic diagram using NAND gates, working and truth table of R S flip- flop. Symbol and Logic diagram using NAND gates, working, truth table and timing diagram of Clocked R S flip flop.
Triggering: edge triggering and level triggering, Symbol and Logic diagram using NAND gates, working, truth table and timing diagram of J-K flip flop.Block diagram and truth table of Master slave J-K flip flop. Symbol, working and truth

table of D- flip flop and T-flip flop. Applications of flip flops, Concept, Modulus, Working, truth table, timing diagram of a counter. Asynchronous counter (3 bit, 4 bit); Design of mod N-counter: working, truth table and timing diagram, 3-bit Synchronous counter: working, truth table and timing diagram, Block diagram, Working, Truth Table and waveforms of Shift register: SISO, SIPO, PISO, PIPO (4-bit) and Universal Shift register (4-bit). Applications of Counters and Registers.

5. Memories **05 hrs**

Classification of memories RAM, ROM, PROM, EPROM, E2PROM.Circuit diagram and working of Static and dynamic RAM

Practical:

Skills to be developed:

Intellectual Skills:

1. Interpret the results
2. Verify the tables

List of Practical:

1) Study of Digital IC datasheets and noting down the characteristics for TTL & CMOS logic families.
2) Verification of truth table of logic gates.
3) Verification of DeMorgan's theorem.
4) Construction of Half adder and Full adder.
5) Implementation of Combinational Circuit using Multiplexer.
6) Construction of 7-segment decoder driver.
7) Verification of truth table of Flip flops.
8) Universal Shift Register
9) Decade counter using IC 7490.
10) Design of 3-bit Synchronous counter.

Text Books:

Name of Authors	Titles of the Book Edition	Name of the Publisher
R.P. Jain	*Modern Digital Electronics*	*Tata McGraw Hill*
Malvino Leach	*Digital Principles*	*Tata McGraw Hill*
Tokheim	*Digital Electronics*	*Tata McGraw Hill*

Reference books :

Name of Authors	Titles of the Book Edition	Name of the Publisher
S.P. Bali	*2000 solved problems in Electronics Sigma series*	*Tata McGraw HillDigital*

SUGGESTED DISTRIBUTION OF MARKS

Topic No	Time Alloted	Marks Alloted
1	10	15
2	9	15
3	16	25
4	24	35
5	5	10

3.6 PRINCIPLES OF COMMUNICATION ENGINEERING

L T P
4 - 2

RATIONALE

The study of principles of communication systems leads to further specialized study of audio and video systems, line communications and microwave communication systems. Thus the diploma-holder in Electronics and Communication Engineering shall find employment in areas of R and D, production, servicing and maintenance of various communication systems. The students should understand the advantage and limitations of various analog and digital modulation systems on a comparative a scale and relate to them while studying practical communication systems.

DETAILED CONTENTS

1. **Introduction** (02hrs)

1.1 Need for modulation and demodulation in communication systems.
1.2 Basic scheme of a modern communication system.

2. **Amplitude modulation** (06 hrs)

2.1 Derivation of expression for an amplitude modulated wave. Carrier and side band components. Modulation index. Spectrum and bandwidth of AM Wave. Relative power distribution in carrier and side bands.
2.2 Elementary idea of DSB-SC, SSB-SC, ISB and VSB modulations, their comparison, and areas of application.

3. **Frequency modulation** (06 hrs)

3.1 Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bessel function) Modulation index, maximum frequency deviation and deviation ratio, BW and FM signals, Carson's rule.
3.2 Effect of noise an FM carrier. Noise triangle, Role of limiter, Need for pre-emphasis and de-emphasis, capture effect.
3.3 Comparison of FM and AM in communication systems.

4. **Phase modulation** (02hrs)

Derivation of expression for phase modulated wave, modulation index, comparison with frequency modulation.

5. **Principles of Modulators** (8 hrs)

Working principles and typical application of:-
- Square Law Modulaton.
- Switching Modulator
- Collector modulator
- Balanced Modulator

6. **Principles of FM Modulators** (08 hrs)

Working principles and applications of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator

7. **Demodulation of AM Waves** (08 hrs)
   7.1 Principles of demodulation of AM wave using diode detector circuit; concept of clipping and formula for RC time constant for minimum distortion (no derivation)
   7.2 Principle of demodulation of AM Wave using synchronous detection.

8. **Demodulation of FM Waves** (08 hrs)
   8.1 Basic principles of FM detection using slope detector
   8.2 Principle of working of the following FM demodulators:-
   - Foster-Seeley discriminator
   - Ratio detector
   - Quadrature detector
   - Phase locked Loop (PLL) FM demodulators

9. **Pulse Modulation** (16 hrs)
   9.1 Statement of sampling theorem and elementary idea of sampling frequency for pulse modulation.
   9.2 Basic concepts of time division multiplexing (TDM) and frequency division multiplexing (FDM).
   9.3 Basic ideas about PAM, PPM, PWM.
   9.4 Pulse code Modulation (PCM) Basic scheme of PCM system.
   9.5 Pulse code Modulation (PCM) Basic scheme of PCM system. Quantization, quantization error, commanding, block diagram of TDMPCM communication system and function of each block. Advantages of PCM systems. Concepts of differential PCM (DPCM).
   9.6 Delta Modulation (DM), Basic principle of delta modulation system, advantages of delta modulation system over PCM system. Limitations of delta modulation, concept of adaptive delta modulation (ADM).

LIST OF PRACTICALS

1. To observe an AM wave on CRO and measure its modulation index.
2. To obtain an AM wave from a square law modulator circuit and observe waveforms.
3. To obtain an FM wave from voltage controlled oscillator circuit and measure the frequency deviation for different modulating signals.
4. To obtain modulating signal from an AM detector circuit and observe the pattern for different RC time constants.
5. To obtain modulating signal from a FM Ratio detector circuit.
6. To observe the sampled signal and compare it with the analog input signal.
7. To observe and note the pulse modulated signals (PAM, PPM, PWM) and compare them with the corresponding analog input signal.
8. To feed an analog signal to a PCM modulator and compare the demodulated signal with the analog input.
9. To o study the process of delta modulation/demodulation.

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

RECOMMENDED BOOKS

1. *Electronics Communication by Kennedy, Tata McGraw Hill, New Delhi*
2. *Electronics Communication by KS Jamwal, Dhanpat Rai and Co, New Delhi Radio Engineering by GK Mittal, Khanna Publishers, New Delhi*
3. *Principles of Communication Engineering by DR Arora, Ishan Publications, Ambala Communication Engineering by A Kumar*
4. *Principles of Communication Engineering by Manoj Kumar, Satya Prakashan, New Delhi.*
5. *Principles of Communication Engineering by Anokh Singh, S. Chand and Co., New Delhi.*
6. *Principles of Communication Engineering by Roody , Coolin*

SUGGESTIVE DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Introduction	2	5
2	Amplitude modulation	6	10
3	Frequency modulation	6	10
4	Phase modulation	2	10
5	Principles of Modulators	8	10
6	Principles of FM Modulators	8	10
7	Demodulation of AM Waves	8	10
8	Demodulation of FM Waves	8	10
9	Pulse Modulation	16	25
Total		**64**	**100**

3.7 Advanced workshop

L T P
- - 2

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. workshop practices are included in the curriculum in order to provide hand on experience about use of diferent tools and basic manufacturing practices.

This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS

1. **Fabrication Techniques**:

Printed Circuit Boards (PCBs):

1.1 PCB board materials, their characteristics and limitations. Surface treatment painting, anodising, plating corrosion and its prevention.

1.2 Photo processing, screen printing etching, high speed drilling, buffing, surface treatment and protection form harsh environments, plated through holes, double sided and multi-layer PCBs.

1.3 Standards board sizes, Modular assemblies, edge connectors, multi board . . racks, flexible boards.

1.4 Assemble of circuits on PCB, soldering techniques, role of tinning, flow and wave soldering. Solderability, composition of solder, Edge connector, Elements of wire shaping.

2. Preparation of PCBs (Handmade and screen printed) from schematic diagrams (4-6 examples such as single transistor voltage stabilizer, regulated supply, timer etc. Using of computer software.

3. Fabrication of small equipment including chassis, front panel etc (4-6 jobs of increasing proportionality) involving different techniques of making chassis/cabinets, panel engraving in mechanical workshops.

4. Concept of computer aided design of single sided and double sided PCB's using software tools.

4.1 ELECTRONIC DEVICES AND CIRCUITS-II

L T P
4 - 2

RATIONALE

Having attained basic knowledge of electronic devices like diodes, transistors, and elementary circuits, in second & third semester semester, this course will enable the students to learn more about the use of transistors in analog circuits like voltage amplifier, power amplifier, multistage amplifier, tuned amplifiers, oscillators, etc. It also gives information about FET, MOSFETs, C-MOS and their applications for effective functioning in the field of electronic service industry.

DETAILED CONTENTS

1. Wave Shaping Circuits (08 hrs)

1.1 General idea about different wave shapes
1.2 RC and RL integrating and differentiating circuits with their applications
1.3 Diode clipping and clamping circuits and simple numerical problems on these circuits

2. Multivibrator Circuits (14 hrs)

2.1 Working principle of transistor as switch
2.2 Concept of multi-vibrator:- astable, monostable, and bistable and their applications
2.3 Block diagram of IC555 and its working and applications
2.4 IC555 as monostable and astable multi-vibrator

3. Operational Amplifiers (18hrs)

3.1 Characteristics of an ideal operational amplifier and its block diagram and Pin Identification
3.2 Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current, input offset voltage, Input Bias current, total output offset voltage, Thermal drift.
3.3 Open loop configurations: Differential, Inverting & Non Inverting.
3.4 Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator
3.5 Concept of Schmitt trigger circuit, Zero crossing detector, Peak Detector,and sample/hold circuit using operational amplifier and their application
3.6 Op-Amp as saw-tooth wave generator.
3.7 Op-Amps with negative feedback:- Block diagram representation of feedback configurations, Voltage-series feedback Amplifier, Voltage shunt feedback amplifier, current series, current shunt.

4. Regulated DC Power Supplies (10 hrs)

4.1 Concept of DC power supply. Line and load regulation

4.2 Concept of fixed voltage, IC regulators (like 7805, 7905), and variable voltage regulator like (IC 723)

4.3 Concept of SMPS

5. Opto-Electronic Devices (08 hrs)

Working principle, characteristics and applications of photo resistors, photo diodes, photo transistors and opto-couplers.

6. IC Based oscillators & PLL. (06 hrs)

VCO (IC 565) and Phase Locked Control (IC 566) and their Applications

LIST OF PRACTICALS

1. To observe the output waveforms of series and shunt diode clipping circuits
2. To observe the output for clamping circuits
3. Use of IC 555 as monostable multivibrator and observe the output for different values of RC
4. Use of IC 555 as astable multivibrator and observe the output at different duty cycles
5. To realize positive and negative fixed voltage DC power supply using three terminal voltage regulator IC (7805, 7812, 7905etc.)
6. To measure the performance parameters of an Op Amp.
7. Application of Op Amp as Inverting and Non Inverting amplifier.
8. Design differentiator and Integrator using Op-Amp.

INSTRUCTIONAL STRATEGY

This subject being of fundamental importance for diploma holders in electronics engineering and related fields, emphasis on conceptual understanding may be given by taking the help of charts, simulation packages etc. Sufficient exercises may given to the students in single stage and multi-stage amplifier circuits in addition to simple exercises in fabricating and testing of various simple d.c circuits. The students may be encouraged to perform some additional practical exercises preferably using breadboards apart from the list provided.

LIST OF RECOMMENDED BOOKS

1. *Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hills, New Delhi*
2. *Electronic Principles by Sahdev, Dhanpat Rai and Sons, New Delhi*
3. *Electronics Principles by Malvino, Tata McGraw Hills, New Delhi*
4. *Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi 5. Electronics Devices and Circuits by Bhupinderjit Kaur,modern Publishers, Jalandhar Basic Electronics by Grob, Tata McGraw Hills, New Delhi*
5. *Art of Electronics by Horowitz*
6. *Electronic Circuit Theory by Boylstead*
7. *Electronic Devices and Circuits by BL Theraja, S Chand and Co Ltd. New Delhi*
8. *Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad*
9. *Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd.,New Delhi*

10. *Electronics Devices and Circuits-I by Naresh Gupta, Jyotesh Malhotra and Harish C.Saini, Eagle Prakashan, Jalandhar*

SUGGESTED DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Wave Shaping Circuits	08	15
2	Multivibrator Circuits	14	20
3	Operational Amplifiers	18	25
4	Regulated DC Power Supplies	10	15
5	Opto Electronic Devices	08	15
6	IC Based oscillators & PLL	06	10
Total		**64**	**100**

4.2 ELECTRONIC INSTRUMENTS AND MEASUREMENT

L T P
2 - 2

RATIONALE

In the real world of work the technician is required to handle wide variety of instruments while testing, trouble shooting, calibration etc. the study of this subject will help students to gain the knowledge of working principles and operation of diferent instruments. During practical sessions, he will acquire the requisite skills.

DETAILED CONTENTS

1. **Basics of Measurements** (06 hrs)
   - 1.1 Measurement, method of measurement, types of instruments.
   - 1.2 Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration.

2. **Voltage, Current and Resistance Measurement** (12 hrs)
   - 2.1 Principles of measurement of dc voltage, dc current, ac voltage, ac current, Principles of operation and construction of permanent magnet moving coil (PMMC) instruments and moving iron type instruments.
   - 2.2 Block diagram of multimeter and measurement of voltage, current and resistance using multimeter
   - 2.3 Limitations with regard to frequency and input impedance

3. **Cathode Ray Oscilloscope** (10 hrs)
   - Construction and working of Cathode Ray Tube (CRT)
   - Time base operation and need for blanking during fly back, synchronization
   - Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls
   - Specifications of CRO and their explanation
   - Measurement of current, voltage, frequency, time period and phase using CRO
   - CRO probes, special features of dual beam, dual trace, delay sweep
   - Digital storage oscilloscope (DSO) : block diagram and working Principle

4. **Signal Generators and Analytical Instruments** (10 hrs)
   - 4.1 Explanation of block diagram, specifications of low frequency and RF generators, pulse generator, function generator.
   - 4.2 Distortion factor meter; wave analyzer and spectrum analyzer

5. **Impedance Bridges and Q Meters** (12 hrs)
   - 5.1 Wheat stone bridge.
   - 5.2 AC bridges: Maxwell's induction bridge,
   - 5.3 Block diagram description of laboratory type RLC bridge, Specifications of RLC bridge
   - 5.4 Block diagram and working principle of Q meter

6. **Digital Instruments** (14 hrs)
   - 6.1 Comparison of analog and digital instruments
   - 6.2 Working principle of ramp, dual slope and integration type digital voltmeter
   - 6.3 Block diagram and working of a digital multi meter.
   - 6.4 Working principle of logic probe, logic pulser, logic analyzer, logic comparator, signature analyzer and logic analyzer.

LIST OF PRACTICALS

1. Measurement of voltage, frequency, time period and phase using CRO
2. Measurement of rise time and fall time using CRO
3. Measurement of Q of a coil and its dependence on frequency
4. Measurement of voltage, frequency, time and phase using DSO
5. Measurement of resistance and inductance of coil using RLC Bridge
6. Measurement of distortion of RF signal generator using distortion factor meter
7. Measurement of time period, frequency, average period using universal counter/ frequency counter
8. Study of spectrum analyser and logic analyser

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

RECOMMENDED BOOKS

1. *Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Sons, New Delhi*
2. *Electronics Instrumentation by Cooper, Prentice Hall of India, New Delhi*
3. *Electronics Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala*
4. *Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi*

SUGGESTIVE DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Basics of Measurements	06	10
2	Voltage, Current and	12	20
3	Cathode Ray Oscilloscope	10	20
4	Signal Generators and	10	15
5	Impedance Bridges and Q	12	15
6	Digital Instruments	14	20
Total		**64**	**100**

4.3 MICROPROCESSOR AND PROGRAMMING

L	P
4	4

RATIONALE

The course provides the student with the oprtunity to study Architecture and memory management of 8 bit & 16 bit microprocessor (i.e 8085& 8086),to study assembly language programming and to implement different system interfacing.

DETAILED CONTENTS

1. Evolution of Microprocessor (04 hrs)

Typical organization of a microcomputer system and functions of its various blocks Microprocessor, its evolution, function and impact on modern society.

2. Architecture of a Microprocessor (With reference to 8085 microprocessor) (12 hrs)

Concept of Bus, bus organization of 8085, Functional block diagram of 8085 and function of each block, Pin details of 8085 and related signals, Demultiplexing of address/data bus generation of read/write control signals, Steps to execute a stored programme.

3. Memories and I/O interfacing (10 hrs)

Memory organization, Concept of memory mapping, partitioning of total memory space. Address decoding, concept of I/O mapped I/O and memory mapped I/O. Interfacing of memory mapped I/O devices. Concept of stack and its function. Basic RAM Cell, N X M bit RAM, Expansion of word length and capacity, static and dynamic RAM, basic idea of ROM, PROM, EPROM and EEPROM.

4. **Programming (with respect to 8085 microprocessor) (16 hrs)**

Brief idea of machine and assembly languages, Machines and Mnemonic codes. Instruction format and Addressing mode. Identification of instructions as to which addressing mode they belong. Concept ofInstruction set. Explanation of the instructions of the following groups of instruction set. Data transfer group, Arithmetic Group, Logic Group, Stack,I/O and Machine Control Group. Programming exercises in assembly language. (Examples can be taken from the list of experiments).

5. Instruction Timing and Cycles (06 hrs)

Instruction cycle, machine cycle and T-states, Fetch and execute cycle.

6. Interrupts (06 hrs)

Concept of interrupt, Maskable and non-maskable, Edge triggered and level triggered interrupts, Software interrupt, Restart interrupts and its use,Various hardware interrupts of 8085, Servicing interrupts, extending interrupt system

7. Data transfer techniques (04 hrs)

Concept of programmed I/O operations, sync data transfer, async data transfer (hand shaking), Interrupt driven data transfer, DMA, Serial output data,Serial Input data

8. 16-bit Microprocessor 8086 (06 hrs)

Silent features of 8086 Microprocessor, architecture of 8086 (Block diagram, signal description), register organization, concepts of pipelining, memory segmentation and memory address generation.

List of Practical.

1) Addition of Two 8 bit numbers.
2) Subtraction of Two 8 bit numbers
3) Multiplication of Two 8 bit numbers
4) Division of Two 8 bit numbers
5) Largest number in an array.
6) Smallest number in an Array.
7) Arrange data of an array in ascending order.
8) Arrange data of an array in ascending order.
9) BCD Up counter
10) BCD Down Counter

Text Books:

1. *An introduction to the Intel family of Microprocessors James L. Antonakos Pearson Education Asia*
2. *Microprocessor Architecture programming & application with the 8085 Ramesh A. Gaonkar, Penfam International*
3. *Digital Electronics and Applications by Malvino Leach; Publishers McGraw Hills, New Delhi*
4. *Microprocessor Architecture, Programming and Applications with 8080/8085 by Ramesh S Gaonker, Willey Eastern Ltd. New Delhi. Microprocessor and Applications by B Ram*

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted	Marks Allotted (%age)
1	4	5
2	12	20
3	10	15
4	16	20
5	06	10
6	06	12
7	04	08
8	06	10

4.4 POWER ELECTRONICS

L T P

4 - 2

RATIONALE

Diploma holders in Electronics and related fields are required to handle a wide variety of power electronic equipment used in process control Industry. This subject will provide the student basic understanding of the principles of their working. The practical training will further re-inforce the knowledge and skill of the students.

DETAILED CONTENTS

1. **Introduction to thyristors and other Power Electronics Devices** . . . . (18 hrs)

- 1.1 Construction, Working principles of SCR, two transistor analogy of SCR, V-I characteristics of SCR.
- 1.2 SCR specifications & ratings.
- 1.3 Different methods of SCR triggering.
- 1.4 Different commutation circuits for SCR.
- 1.5 Series & parallel operation of SCR.
- 1.6 Construction & working principle of DIAC, TRIAC & their V-I characteristics.
- 1.7 Construction, working principle of UJT, V-I characteristics of UJT. UJT as relaxation oscillator.
- 1.8 Brief introduction to Gate Turn off thyristor (GTO), Programmable uni-junction transistor (PUT).
- 1.9 Basic idea about the selection of Heat sink for thyristors.
- 1.10 Applications such as light intensity control, speed control of universal motors, fan regulator, battery charger.

2. **Controlled Rectifiers** (08 hrs)

- 2.1 Single phase half wave fully controlled rectifier with R & R-L load.
- 2.2 Single phase half controlled full wave rectifier with R & R-L Load.
- 2.3 Single face fully controlled full wave bridge rectifier R & R-L Load.
- 2.4 Single phase fully controlled full wave centre tap rectifier R & R-L Load.

3. **Inverters, Choppers, Dual Converters and Cyclo converters.** (16 hrs)

- 3.1 Principle of operation of basic inverter circuits, concepts of duty cycle, series & paralle inverters & their applications.
- 3.2 Choppers: Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step down choppers.
- 3.3 Dual Converters and cyclo converters: Introduction, types & basic working principle of dual converters and cyclo converters & their applications.

4. **Thyristorised Control of Electric drives** (14 hrs)

4.1 DC drive control

i) Half wave drives.
ii) Full wave drives
iii) Chopper drives (Speed control of DC motor using choppers)

4.2 AC drive control

i) Phase control
ii) Constant V/F operation
iii) Cycloconverter/Inverter drives.

5. **Uninterrupted Power supplies** (08 hrs)

5.1 UPS, on-line, off line & their specifications
5.2 Concept of high voltage DC transmission
5.3 Idea of SMPS

LIST OF PRACTICALS

1) To plot VI characteristic of an SCR.
2) To plot VI characteristics of DIAC.
3) To plot VI characteristics of TRIAC.
4) To plot VI characteristics of UJT and its use as relaxation oscillator.
5) Observation of wave shape of voltage at relevant point of single-phase half wave controlled rectifier and effect of change of firing angle.
6) Observation of wave shapes of voltage at relevant point of single phase full wave controlled rectifier and effect of change of firing angle.
7) Observation of wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit for varying lamp intensity.
8) Speed control of motor using SCR

INSTRUCTIONAL STRATEGY

Power Electronics being very important for industrial controls requires a thorough know how about industrial devices. Teacher should take to the class various SCRs and other semiconductor devices to demonstrate these to the students. The teacher may encourage students to perform practical simultaneously for better understanding of the subject and verification of theoretical concepts. So industrial visit in between the course is a must.

Recommended Books:

1) *Power Electronics by P.C. Sen Tata Mc Graw Hill. New Delhi*
2) *Power Electronics by P.S. Bhimbhra, Khanna Publishers, New Delhi*
3) *Power Electronics by M.S. Berde, Khanna Publishers, New Delhi.*
4) *Power Electronics by MH Rashid*
5) *Industrial Electronics and Control by SK Bhattacharya and S. Chatterji, New Age Publications. New Delhi*
6) *Power Electronics by S Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi*
7) *Power Electronics by Sugandhi and Sugandhi*
8) *Power Electronics – Principles and Applications by J Michael Jacob, Vikas Publishing House, New Delhi*

SUGGESTIVE DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted%
1	Introduction to thyristors and other power electronics devices	18	30
2	Controlled Rectifiers	08	15
3	Inverters, Choppers, Dual Converters and Cyclo converters.	16	25
4	Thyristorised Control of Electric drives	14	20
5	Uninterrupted Power supplies	08	10
Total		**64**	**100**

4.5 COMMUNICATION SYSTEMS-I

L T P
4 - 2

RATIONALE

This course provides the basics of electronic communication systems including transmitters, receivers, antennas and various modes of propagation of signals. In addition to components and systems of fiber optic communication, the students will learn the basics of satellite communication. This course will provide the students with perspectives of diferent communication systems.

DETAILED CONTENTS

1. **AM/FM Transmitters** (08 hrs)
   a) Classification of transmitters on the basis of modulation, service, frequency and power
   b) Block diagram of AM transmitters and working of each stage

2. **AM/FM Radio Receivers** (16 hrs)
   a) Principle and working with block diagram of super heterodyne of AM receiver. Function of each block and typical waveforms at input and output of each block
   b) Performance characteristics of a radio receiver sensitivity, selectivity, fidelity S/N ratio, image rejection ratio and their measurement procedure. ISI standards on radio receivers (brief Idea)
   c) Selection criteria for intermediate frequency (IF). Concepts of simple and delayed AGC
   d) Block diagram of an FM receiver, function of each block and waveforms at input and output of different blocks. Need for limiting and de-emphasis in FM reception
   e) Block diagram of communication receivers, differences with respect to broadcast receivers.

3. **Antennas:** (16 hrs)
   a) Electromagnetic spectrum and its various ranges: VLF, LF, MF, HF, VHF, UHF, Microwave.
   b) Physical concept of radiation of electromagnetic energy from a dipole. Concept of polarization of EM Waves.
   c) Definition and physical concepts of the terms used with antennas like point source, gain directivity, aperture, effective area, radiation pattern, beam width and radiation resistance, loss resistance.
   d) Types of antennas-brief description, characteristics and typical applications of half wave dipole, folded dipole, loop antenna, yagi and ferrite rod antenna
   e) Brief description of broad-side and end fire arrays, their radiation pattern and applications (without analysis)

4. **Propagation:** (14 hrs)

   a) Basic idea about different modes of wave propagation and typical areas of application. Ground wave propagation and its characteristics, summer field equation for field strength.
   b) Space wave communication – line of sight propagation, standard atmosphere, concept of effective earth radius range of space wave

propagation standard atmosphere

c) Duct propagation: sky wave propagation - ionosphere and its layers. Explanation of terms - virtual height, critical frequency, skips distance, maximum usable frequency, and multiple hop propagation.

5. **Satellite Communications*:*** (10 hrs)

- Basic idea, passive and active satellites, Meaning of the terms; orbit, apogee, perigee

- Geo-stationary satellite and its need. Block diagram and explanation of a satellite communication link.

LIST OF PRACTICALS

1. To plot the sensitivity characteristics of a radio receiver and determination of the frequency for maximum sensitivity.
2. To plot the selectivity characteristics of a radio receiver.
3. To plot the fidelity characteristics of a radio receiver.
4. To plot the radiation pattern of a directional and omni directional antenna.
5. To plot the variation of field strength of a radiated wave, with distance from a transmitting antenna.

Preferably a visit to AM /FM transmitter.

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

RECOMMENDED BOOKS

1. *Communication systems By George Kennedy Tata McGraw Hill, New Delhi.*
2. *Communication systems By A.K. Gautam, SK Katria and Sons, New Delhi.*
3. *Electronic communication sytesms By K.S. Jammal, Dhanpat Rai and Sons, New Delhi.*
4. *Electronic communication system by Roddy and Coolen Prentice Hall of India, New Delhi.*
5. *Handbook of Experiments in Electronics and Communication Engineering by S. Poornachandra Rao, and B Sasikala, Vikas Publishing House Pvt Ltd, Jangpura, New Delhi.*

SUGGESTIVE DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted%
1	AM/FM Transmitters	08	15
2	AM/FM Radio Receivers	16	25
3	Antennas	16	25
4	Propagation	14	20
5	Satellite Communications	10	15
Total		**64**	**100**

4.6 TROUBLE SHOOTING OF ELECTRONIC EQUIPMENT

L T P
4--2

RATIONALE

The course provides the students with necessary knowledge and competency to diagnose the faults for trouble shooting and for systematic repair and maintenance of electronic equipment and testing of components.

DETAILED CONTENTS

1. **Repair, Servicing and Maintenance Concepts** (10 hrs)
   Introduction, Modern electronic equipment, Mean time between failures (MTBF), Mean time to repair (MTR), Maintenance policy, preventive maintenance, corrective maintenance.
   a) Study of basic procedure of service and maintenance
   b) Circuit tracing techniques
   c) Concepts of shielding, grounding and power supply considerations in instruments.

2. **Fundamental Trouble Shooting Procedures** (12 hrs)
   I) Fault location
   ii) Fault finding aids
   - Service manuals
   - Test and measuring instruments
   - Special tools

   iii) Trouble Shooting Techniques
   - Functional Areas Approach
   - Split half method
   - Divergent, convergent and feedback path circuit analysis
   - Measurement techniques

3. **Passive Components** (08 hrs)
   Test procedures for checking passive components i.e. resistors, capacitors, inductors, chokes and transformers.

4. **Semiconductor Devices (From testing procedure point of view) (10** hrs)

   Diodes, rectifier and zener diodes. Bipolar transistors. Field effect transistors JFET and MOSFET. Thyristors, uni-junction transistors, Photo cells, Transistor equivalents from data Books.

5. **Trouble-Shooting Digital Systems** (06 hrs)

   Typical faults in digital circuits. Use of Logic clip, logic probe, logic pulsar, IC tester

6. **Typical examples of troubleshooting (12** hrs**.)**
   Power supply, CRO, Mobile phone, FAX machine, Printer, Signal generator.

7. **Log Book and History Sheet (2Hrs.)**
   Introduction, preparation and significance of log book and History sheet.

8. **Production Planning** **(4 Hrs)**

Storage and supply of components for assemble, role of incoming inspection of components, assemble line reduction, tools and jigs per lead bending. Manual and automatic insertion techniques. Closed loop assemble of modules and/or complete instruments.

LIST OF PRACTICALS

1. Selection, demonstration and correct use of tools and accessories: pliers, wire cutter, wire stripper, tweezers, soldering iron, desoldering tools, neon tester, screw driver
   - Accessories : insulating tapes, solders, solder tips, fluxes, desoldering wick, solder cleaning fluids, sleeves, tags, identifiers
2. Develop skill in assembly of components, wiring, soldering and desoldering methods
3. Selection and use of commonly used passive components and accessories
4. Testing of active and passive components
5. Testing of linear integrated circuits
6. Use of digital tools for troubleshooting digital components such as logic probes, logic pulsar etc

RECOMMENDED BOOKS

1. *Repair Manuals*
2. *Specifications of Equipment supplied by the manufacturer*
3. *Introduction to Biomedical Equipment Technology – Joseph J. Carr and John M Brown.*
4. *Principles of Biomedical Instrumentation and measurement – Richard Aston.*
5. *Introduction to Biomedical Equipment Technology by Carr and Brown, Regents and Prentice Hall of India, New Delhi*
6. *Principles of Bio-medical Instrumentation and Measurements by Leslie Cromwell, Fred J Weibell, Erich A Pfeifer Prentice Hall of India, New Delhi*
7. *Handbook of Biomedical Engineering- R.S. Khandpur.*
8. *Modern Electronic Equipment Trouble shooting, Repair and Maintenance by RS Khandpur, Tata McGraw Hill Publishing House, New Delhi*
9. *Bio-medical Instrumentation by M Arumugam, Anuradha agencies Publishers, Vidayakaruppur, Kumbakonam RMS*

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Repair, Servicing and Maintenance Concepts	10	15
2	Fundamental Trouble Shooting Procedures	12	20
3	Passive Components	08	10
4	Semiconductor Devices (From testing procedure point of view)	10	10
5	Trouble-Shooting Digital Systems	06	10
6	Typical Examples of Troubleshooting	12	20
7.	Log Book and History Sheet	02	05
8.	Production Planning	04	10
Total		**64**	**100**