UNIVERSITY POLYTECHNIC,
BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215 (RANCHI)

INSTITUTE VISION

To emerge as a leading technical training institution in the country and serve the nation and engineering profession with distinction by developing the most skilled human resources with comprehensive and modern training and skill-sets in selected engineering disciplines and trades.

INSTITUTE MISSION

1. To administer a technical training institute of highest standard of education and training commensurate with modern engineering practices.
2. To offer technical diploma, and certificate courses to cater to contemporary demand and relevance to the engineering industry.
3. To adopt and implement modern curriculum of technical education and training.
4. To continuously upgrade the infrastructure necessary for practical training with new and contemporary machines and methods.
5. To arrange on job training and internships for the students and staff members with proper supervision.
6. To liaise with industry for internship and collaboration, and also, for arranging periodic review of infrastructure and training methods and modernizing teaching and training curriculum.
7. To create special program for the youth of the State of Jharkhand to help them acquire entrepreneurial and managerial skills, manufacturing capability, career advancement training and professional confidence.

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ELECTRONICS & COMMUNICATIONS ENGINEERING

DEPARTMENT VISION

To strive towards the development of the skilled human resources with comprehensive and modern technical skill-sets in the field of Electronics and Communication Engineering while adhering to Universal Human Values to serve the nation and engineering profession with distinction.

DEPARTMENT MISSION

1. To offer quality technical education and skill development in the field of electronics and communication engineering.
2. To nurture students' problem-solving abilities and familiarize them with the most recent advancements within the Electronics & Communication discipline.
3. To promote interactions between industry and the institute to enhance students' employability and readiness for the workforce.
4. To encourage faculty engagement in Faculty Development Programs focused on upcoming technologies within Electronics and Communication and to additionally, coordinate a range of technical activities, including electronic circuitry, simulation software, and troubleshooting, for students and staff under the department's appropriate supervision.
5. To facilitate partnerships with industry for internships and collaborations, and update the teaching and training curriculum within the field of Electronics and Communication Engineering, emphasizing the department's key strengths.
6. To develop a distinctive program that enables students to gain entrepreneurial and managerial proficiencies in the Electronics and Communication industry. This initiative is intended to merge with Universal Human Values to instil ethical values in students, thus fostering a commitment to serving the nation and the profession.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The program in Electronics and Communication Engineering will prepare students:

PEO1: To develop expertise amongst students to understand and solve real-life problems related to Electronics and Communication Engineering by applying the knowledge acquired.

PEO2: To adapt to state-of-the-art Electronics and Communication Engineering technologies to work in multidisciplinary environments.

PEO3: To respond to the growing and changing needs of industries and academics through continuous learning of modern technologies in Electronics and Communication.

PEO4: To inculcate an attitude to work efficiently in a team with professional ethics and universal human values.

(A) PROGRAM OUTCOMES (POs)

Diploma holders of the Electronics & Communication Engineering Program will be able to:

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and Electronics and Communication engineering to solve the engineering problems.

2. **Problem analysis:** Identify and analyse well-defined engineering problems using codified standard methods.

3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

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4. **Engineering Tools, Experimentation and Testing:** Apply modern engineering tools and appropriate techniques to conduct standard tests and measurements.

5. **Engineering practices for society, sustainability, and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.

6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

7. **Life-long learning:** Ability to analyse individual needs and engage in updating in the context of technological changes.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Apply the knowledge acquired in basic sciences and engineering to solve electronics and communication engineering problems.

2. To develop proficiency in the installation, troubleshooting, and maintenance of electronic equipment and appliances.

3. To develop advanced skills in various domains of Electronics and Communication Engineering.

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SYLLABUS

SEMESTER-III

Diploma in Electronics & Communications Engineering

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Course Structure

Diploma in Electronics & Communications Engineering

Third Semester

Subject Code	Subject	Theory	Tutorial	Lab.	Credit
DMA 3201	Applied Mathematics	3	0	0	3
DEC 3101	Basic Electronics	3	1	0	4
DMM 3003	Applied Mechanics	3	0	0	3
DEC 3003	Digital Electronics	3	1	0	4
DCS 3001	C Programming	3	1	0	4
DEC 3102	Basic Electronics Lab.	0	1	2	2
DMM 3004	Applied Mechanics Lab.	0	0	2	1
DEC 3004	Digital Electronics Lab.	0	0	2	1
DCS 3002	C Programming Lab.	0	1	2	2
DHU 3002	Professional Practices-II	0	0	2	1
DGA3002/04/06/08	PT and Games/NSS/NCC/CA	0	0	2	1
	Periods per week	**15**	**5**	**12**	-
	Total credits	-	-	-	**26**
	Total Periods per week	-	-	-	**32**

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Diploma in Electronics & Communications Engineering (Semester-III)

DMA3201 APPLIED MATHEMATICS

Course Objectives: This course enables the students to learn how to extend the principles of single variable differential and integral calculus to multivariable and vector framework and how to solve ordinary differential equations of first or higher order, and also basics of statistics and probability. These different mathematical methods are prerequisite for studying other subjects in engineering fields. Students are going to learn the following topics:

1. **Determinant and Matrices with Solution of System Linear Equations**
2. **Ordinary Differential Equations (ODE) of First Order**
3. **Linear Differential Equations of Second and Higher Order**
4. **Partial Differentiation and Multiple Integrals**
5. **Vector Calculus**

Course Outcomes: After completion of the course, the learners will be able to:

1. **Develop the essential skills of using Determinant and Matrices to Solve System Linear Equations**
2. **Learn to analytically solve the First order ODEs necessary for Modelling Engineering problems.**
3. **Acquire necessary ability to solve Second order or higher linear ODEs.**
4. **Acquire necessary ability to solve problems of Partial Differentiation and Multiple Integrals.**
5. **Learn and apply Vector Calculus to solve technical problems.**

Syllabus

Module	Topics	Lectures
Module-I: Determinant and Matrices with Solution of System Linear Equations:	1.1. Definition of a matrix of order *m* x *n* and types of matrices. Algebra of matrices such as equality, addition, subtraction, scalar multiplication, and transpose of a matrix. 1.2. Definition and evaluation of determinants of order 2 and 3. 1.3. Minor, cofactor of an element in a matrix, adjoint of matrix and inverse of matrix by adjoint method. Solution of simultaneous equations containing 2 and 3 unknowns with applications.	6
Module-II:	2.1. Definitions of ODE and meaning of solution of ODE.	8

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Ordinary Differential Equations (ODE) of First Order:	Formation of ODE. 2.2. Solution of ODE of first order and first degree: Variable separable method, Homogenous equations, 2.3. Equations reducible to homogenous form, Exact equations, 2.4. Linear equations, Bernoulli equations.	
Module-III: Linear Differential Equations of Second and Higher Order	3.1 Definition of linear ODE. The operator 'D'. Auxiliary Equations (A.E.) and rules of finding Complementary Function (C.F.). 3.2 The inverse Operator $\frac{1}{f(D)}$. 3.3 Rules for finding the Particular Integral (P.E.).	6
Module-IV: Partial Differentiation and Multiple Integrals:	4.1 Functions of two or more variables. Partial derivatives of first and higher order. 4.2 Differentiation of composite functions. 4.3 Jacobians and its properties. 4.4 Evaluation of double integral. Change of order of integration 4.5 Finding area and volume using double integration. Change of variables from Cartesian to polar.	8
Module-V: Vector Calculus:	5.1 Definition Vector functions and its derivative. Velocity and acceleration. 5.2 Concepts of Scalar and Vector Fields. Gradient of scalar field. Directional Derivative and its geometrical interpretation. Properties of Gradient. 5.3 Divergence and Curl of a vector function and their properties. Physical interpretation of divergence and curl. 5.4 Integration of vector functions. Concept of line integral. Work done by a force. Surface and volume integral.	10
Text Books:	1. **(T1**) R. S. Agarwal, Senior Secondary School Mathematics for Class 12, Bharati Bhavan Publishers & Distributors. (**T2**) N.P. Bali and Manish Goyal. "A Textbook of Engineering Mathematics". Laxmi Publications Pvt. Ltd.	
Reference Book:	1. (**R1**) B. S. Grewal. Higher Engineering Mathematics. Khanna Publication, New Dehli. 2. **(R2)** Erwin Kreyszig. Advanced Engineering Mathematics. John Wiley & Sons, Inc. 3. **(R3)** Murray R Spiegel. Vector Analysis and an Introduction to Tensor Analysis. Schaum's Outline series. McGraw-Hill.	

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Diploma in Electronics & Communications Engineering (Semester-III)

DEC 3101 BASIC ELECTRONICS

Course Objectives:

This course enables the students to:

1 Draw and describe the basic circuits of rectifier, filter, regulator and amplifiers.
2 Read data sheets and testing of diodes and transistors.
3 Know voltage and power amplifiers.
4 Understand feedback concepts and operation of oscillators.
5 Basic understanding of FET characteristics.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Understand the basic circuits of rectifier, filter, regulator and amplifiers.
CO2 Identify diodes and transistors characteristics through data sheets and testing instruments.
CO3 Demonstrate the applications and circuits of voltage and power amplifiers.
CO4 Demonstrate feedback concepts and operation of oscillators.
CO5 Understand JFET, MOSFET and CMOS Characteristics and applications.

Module-I: **(12)**

Rectifiers and Filters: Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC filter and RC filter.

Introduction to Bipolar transistor and Biasing Circuits: CB, CE, CC configuration of the transistor; Input and output characteristics in CB and CE configurations; Current amplification factors. D.C load line and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits.

Module-II: **(10)**

Single Stage Transistor Amplifier: Single stage transistor amplifier circuit, a.c load line and its use in calculation of currents and voltage gain of a single stage amplifier circuit. H- Parameters and their significance.

Multistage Amplifiers: Need for multistage amplifier, Gain of multistage amplifier, Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth.

Module-III: **(10)**

Power Amplifier: Class A, Class B, Class AB, and Class C amplifiers, collector efficiency and Distortion in class A,B,C; Single ended power amplifiers, Push-pull amplifier, and complementary symmetry push-pull amplifier

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Tuned Voltage Amplifiers: Series and parallel resonant circuits and bandwidth of resonant circuits, Single and double tuned voltage amplifiers and their frequency response characteristics.

Module-IV: **(10)**

Feedback in Amplifiers: Basic principles and types of feedback, Derivation of expression for gain of an amplifier employing feedback, Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier, RC coupled amplifier with emitter bypass capacitor, Emitter follower amplifier and its application
Sinusoidal Oscillators: Use of positive feedback, Barkhausen criterion for oscillations, Different oscillator circuits (working principles)-tuned collector, Hartley, Colpitts, phase shift, Wien's bridge, and crystal oscillator.

Module-V: **(8)**

Field Effect Transistors: Construction, operation and characteristics of FET and its application. Construction, operation and characteristics of MOSFET in depletion and enhancement modes and their applications. CMOS - advantages and applications, Comparison of JFET, MOSFET and BJT - FET amplifier circuit and its working principle. (No analysis).

Text and Reference books:

1. Basic Electronics and Linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Principles of Electrical and Electronics & Communications Engineering by VK Mehta; S Chand and Co., New Delhi
3. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
4. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill, New Delhi
5. Electronic Principles by Sahdev, Dhanpat Rai and Sons, New Delhi.

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Diploma in Electronics & Communications Engineering (Semester-III)

DMM3003 APPLIED MECHANICS

OBJECTIVE: Students will be able to

1. Know basic concepts about force system.
2. Learn to find the resultant of given force system.
3. Recognize Concept of moment of inertia, determination of centre of gravity of lamina .
4. Conceptualize friction and its laws.
5. Efficiency and establish law of machine .Find M.A., V.R.

Course Outcomes:

1. Identify the force systems for given conditions by applying the basics of mechanics.
2. Solve the simple equilibrium problems.To be able to draw the free body diagrams of mechanical components and systems.
3. Find the centroid,centre of gravity and moment of inertia of various components in engineering systems.
4. To understand the phenomenon of friction and ability to solve problem related to the same.
5. Select the relevant simple lifting machine's for given purposes.

Module-I: **(10)**

Force System Fundamentals: - Definitions of mechanics, statics and dynamics, scalar and vector, Engineering Mechanics law, principle of transmissibility, Triangle and parallelogram and polygon law, Resolution of forces, Resultant of a forces system, Moment of a force, Definition, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments Varignon's theorem of moment, Couple.

Module-II: **(8)**

Equilibrium: Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram, General condition of equilibrium, Action & reactions, Equilibrium of a particle under Three Forces.

Module-III: **(7)**

Centroid and Moment of inertia: Centroid**:** Definition of centroid. Moment of an area about an axis, Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure, Center of gravity such as cylinder, sphere, hemisphere, cone, cube, and rectangular block , Radius of Gyration, parallel and perpendicular axis of Theorem, moment of inertia of standard forms and moment of inertia of composite Materials.

Module –IV: **(8)**

Friction: Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction angle of repose and coefficient of friction. Cone of friction, types of friction, and laws of friction, advantages and disadvantages of friction, Equilibrium of bodies on level plane external force applied horizontal and inclined up and down. Equilibrium of bodies on inclined plane.

Module –V: **(7)**

Simple Machines: Definitions of simple machine, compound machine, load, effort, mechanical advantage, velocity ratio. Input on a machine, output of a machine, and efficiency of a machine, expression for

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mechanical advantage, velocity ratio and efficiency of a machine. Ideal machine, ideal effort and ideal load, friction in machines, effort lost in friction and frictional load. Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self-locking machine.

Text Books:

1. Engineering Mechanics - Beer – Johnson
2. Engineering Mechanics - Basu

Reference Books:

1. A Textbook of Engineering Mechanics, written by Dr. R. K. Bansal.
2. . Engineering Mechanics, written by R. K. Rajput.

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Diploma in Electronics & Communications Engineering (Semester-III)
DEC3003 DIGITAL ELECTRONICS

Course Objective: Student will be able to:

1. Know the fundamental principles of Digital circuits
2. Familiar with available IC chips and simplify logic functions.
3. Understand the operation of flip-flops.
4. Identify and understand the operation of registers and counters.
5. Describe working of multivibrators and simple linear wave shaping techniques.

Course Outcomes:

After completion of the course, the students will be able to:

CO1	Understand the fundamental principles of Digital circuits.
CO2	Identify available IC chips and simplify logic functions.
CO3	Demonstrate the applications and circuits of flip-flops.
CO4	Demonstrate the applications and circuits of registers and counters.
CO5	Understand and apply multivibrators and linear wave shaping techniques in digital circuits.

Module-I: **(8)**

Fundamentals: Binary numbers, Octal and Hexadecimal numbers, Conversion from one number system to another, BCD numbers, Binary arithmetic, floating point number system, Binary codes, Error detection codes. Boolean Algebra, Boolean Theorems, De-Morgan's Theorem, Duality Theorems, Minimization using Boolean Algebra / Boolean Theorems Logic Gates.

Module-II: **(12)**

Simplification: Maxterms and Minterms (Standard and Canonical forms), SOP and POS forms of expressing functions, Karnaugh Map (K-map) method of minimization of functions.

Combinational Logic Circuits: Half adder and Full adder circuit, design and implementation. Binary Encoder, Binary Decoders, Parity Generators/Checkers, Controlled inverter, Adders, Multiplexers, Demultiplexers.

Module-III: **(8)**

Flip – Flops: Concept and types of latch with their working and applications, Operation using waveforms and truth tables of SR flip-flop -Clocked and Unclocked, D-flip-flop, J-K flip-flop, Master-slave JK flip-flops, Difference between a latch and a flip flop, Realization of one flip-flop using other

Module-IV: **(12)**

Registers: Introduction and basic concepts including shift left and shift right, Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out, Bi-directional Storage Register, Universal shift register, Buffer register, Tristate Buffer register , IC 7495.

Counters: Introduction to Asynchronous and Synchronous counters, Binary counters, Divide by N ripple counters, Decade counter, Pre settable and programmable counters, Up/down counter, Ring counter with timing diagram, Counter ICs and Memories.

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Module-V: **(10)**

Multivibrators: Transistor based Multivibrators, Circuit, working procedure and applications of Astable, Bistable & Monostable multivibrators.
Linear wave Shaping: Series and Parallel diode clipping circuit, clamping a waveform to zero level.

Text and Reference books:

1. Digital Electronics (Circuits, Systems & Ics) by S. N. Ali (Galgotia Publishers).
2. Pulse and Digital Circuits by Mothiki S. Prakash Rao (TMH)

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Diploma in Electronics & Communications Engineering (Semester-III)

DCS 3001 C PROGRAMMING

Course Objectve:

1. To develop programming skills using the fundamentals and basics of C language.
2. To present the syntax and semantics of the "C" language as well as data types offered by the language.
3. To study the advantages of user defined data type which provides flexibility for application development.
4. To teach the basics of preprocessors available with C compiler.
5. To impart the knowledge about pointers which is the backbone of effective memory hand

Course Outcomes:

After completing this course students will be able to:

1. Develop algorithm and write c programs for solving simple problems.
2. Use c operators and expressions for mathematical computation and data manipulation.
3. Apply programming constructs effectively for solving relatively complex problems.
4. Use arrays effectively for solving problems involving collection of data, matrices or strings.
5. Implement modular design in programs and use pointers to access and manipulate variables.

Module-I: **(8)**

Programming techniques and overview of C language: Algorithm and Programming Development, Steps in development of a program. Flow charts, Algorithm development, Program Debugging, Program Structure. Formatted input, formatted output., assignment statements, Constants, variables and data types.

Module-II: **(8)**

Operators and Expressions: Arithmetic, Relational, Increment, increment, Assignment, logical and Conditional Operators ,Operator precedence and associativity, type casting, sizeof() operator, Math functions sqrt(), pow(), sin(), cos() and tan() .

Module-III: **(8)**

Decision making and branching: if statement (if, if-else, else-if ladder, nested if-else), Switch case statement, break statement, goto. Decision making and looping**:** while, do, do-while statements for loop, continue statement.

Module-IV: **(8)**

Arrays and Strings: Declaration and initialization of one dimensional, two dimensional and character arrays, accessing array elements. Declaration and initialization of string variables, string handling functions from standard library (strlen (), strcpy (), strcat (),strcmp ()).

Module-V: **(8)**

Functions: Need of functions, scope and lifetime of variables, defining functions, function call (call by value, call by reference), return values, storage classes. Category of function (No argument No return value, No argument with return value, argument with return value), recursion.

Pointers: Understanding pointers, declaring and accessing pointers, Pointers arithmetic, pointers and arrays.

Text and Reference Books:-

1. E Balagurusamy, "Programming in ANSI C" Tata McGraw-Hill, New Delhi.
2. Ashok N. Kamthane, "Programming in C" Pearson Education India, New Delhi.

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UNIVERSITY POLYTECHNIC
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Diploma in Electronics & Communications Engineering (Semester-III)

DEC3102 BASIC ELECTRONICS LAB.

Course Objectives:

This course enables the students to:

1 To draw and describe the circuits of half wave rectifier & effect of the use of filter

2 To draw and describe the circuits of full wave rectifier & effect of the use of filter in rectifiers.

3 To designing passive filters and understanding CE transistors characteristics.

4 To understand CB & CC transistors characteristics.

5 To design BJT and FET amplifier circuit while understanding operations & characteristics.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Understand the circuits of half wave rectifier & effect of the use of filter.

CO2 Understand the circuits of full wave rectifier & effect of the use of filter in rectifiers.

CO3 Demonstrate the applications and circuits of passive filters and CE transistors.

CO4 Demonstrate the applications and circuits of CB & CC transistors.

CO5 Understand BJT and FET amplifier circuit characteristics and applications.

List of Experiments:

MODULE I **(2)**

1. Measurement of Frequency and voltage using CRO.
2. Half-Wave Rectifier Circuit Without and With Filter

MODULE II **(2)**

3. Full-Wave Centre-tap Rectifier Circuit Without and With Filter.
4. Full-Wave Bridge Rectifier Circuit Without and With Filter.

MODULE III **(2)**

5. RC circuit as a filtering network.
6. Input and output characteristics and calculate parameters of transistors in CE configuration.

MODULE IV **(2)**

7. Input and output characteristics and calculate parameters of transistors in CB configuration.
8. To study the emitter follower circuit.

MODULE V **(2)**

9. Measurement of Voltage Gain, input, output impedance in single state CE amplifier circuit.
10. V-I characteristics of FET amplifier.

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Text and Reference books:

1. Basic Electronics and Linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Principles of Electrical and Electronics & Communications Engineering by VK Mehta; S Chand and Co., New Delhi
3. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.

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UNIVERSITY POLYTECHNIC
BIT MESRA, RANCHI

Diploma in Electronics & Communications Engineering (Semester-III)

DMM 3004 APPLIED MECHANICS LAB.

COURSE OBJECTIVE:

1. Perform and solve problems concerning simple application of moments and forces.
2. To know the idea about flywheel.
3. Ideas about angle of friction, angle of repose.
4. Grasp the idea of the mechanical advantage, velocity ratio and efficiency of Simple machine.
5. Grasp the idea about compound machine, self locking machine and law of machine.

COURSE OUTCOMES:-

1. To be able to learn the concept of friction through inclined plain experiment.
2. To be able to understand engineering utility of jib cranes,
3. To be able to understand practical application of mechanical advantages.
4. To be able to understand fundamental principle of law of machines,screw jack
5. To be able to understand the concept of winch crab,axle and wheels. Pulley system.

LIST OF EXPERIMENTS:

1. To verify the Polygon Law of Forces, with the help of force polygon apparatus.
2. To verify the parallelogram law of forces.
3. To find out forces in the jib member and tie member of the jib crane experimentally and verify it analytically and graphically.
4. To determine the magnitude, direction and position of the resultant force experimentally and also to check the same graphically by constructing the Funicular Polygon diagram.
5. To find moment of inertia of flywheel.
6. Comparison of coefficient of friction of various pairs of surfaces & determination of angle of repose.
7. To determine the effort required for lifting various loads by using 5-pulley block systems and draw the following graphs.
   a. Load vs. Effort
   b. Load vs. Effort lost in friction.
   c. Load vs. Efficiency.
8. To find the mechanical advantage, velocity ratio and efficiency in the case of Screw Jack.
9. To find the mechanical advantage, velocity ratio and efficiency in the case of Winch Crab Single Graphical Representation.
10. To study the performance of differential axle and wheel and find its velocity ratio, efficiency and law of machine.

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Diploma in Electronics & Communications Engineering (Semester-III)

DEC 3004 DIGITAL ELECTRONICS LAB

Course Objectives:

This course enables the students to:

1 Identify and construct basic and universal gates using ICs.
2 Design and implementation of code converters using logic gates.
3 Implementing verification circuits for De Morgan's theorems.
4 Design and implementation of SR Flip-Flops and Adder circuits.
5 Design and realization of a parity bit checker & generator.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Understand the pin layouts & use of basic and universal gates using ICs.
CO2 Demonstrate and implement code converters using logic gates.
CO3 Demonstrate the applications De Morgan's theorems.
CO4 Demonstrate and implement SR Flip-Flops and Adder circuits.
CO5 Demonstrate and implement parity bit checker & generator.

List of experiments:

Module I: **(2)**

1. Verification of basic Logic gates
2. Verification of Universal logic gates and realization of basic gates

Module II: **(2)**

3. Design and implementation of BCD to excess-3 code and vice versa code converters using logic gates
4. Design and implementation of Binary to gray and vice-versa code converters using logic gates.

Module III: **(2)**

5. Prove De Morgan's 1st theorem.
6. Prove De Morgan's 2nd theorem.

Module IV: **(2)**

7. Design and realization of S.R. flip-flop using IC 7400.
8. Construction of Half Adder and Full Adder.

Module V: **(2)**

9. Design and realization of a parity bit checker using IC 7486.
10. Design and realization of parity bit generator using IC 7486.

Text and Reference books:

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1. Digital Electronics (Circuits, Systems & Ics) by S. N. Ali (Galgotia Publishers).
2. Pulse and Digital Circuits by Mothiki S. Prakash Rao (TMH)

Diploma in Electronics & Communications Engineering (Semester-III)

DCS 3002 C PROGRAMMING LAB.

COURSE OBJECTIVES:

1. To enable students to implement simple programs using variables and I/O statements.
2. To enable students to implement mathematical expressions in their programs.
3. To enable students to use decision-making and looping statements in their programs.
4. To enable students to use arrays and structures to organize their data.
5. To enable students write their own functions to implement modular design.

COURSE OUTCOMES:

After completing this course students will be able to:

1. write simple programs using variables and I/O statements.
2. implement mathematical expressions in their programs.
3. use decision-making and looping statements to formulate their logic.
4. use arrays and structures to organize their data and write efficient code.
5. write their own functions to implement their modular program design.

List of Experiments

1. Write Programs in C to implement.

2. Programming Exercise on Executing and Editing a C Program.

3. Programming Exercise on defining Variable and assigning values to variables.

4. Programming Exercise on arithmetic's and relational operators.

5. Programming Exercise on arithmetic expression and their evaluation.

6. Programming Exercise on formatting input/output using printf and scanf.

7. Programming Exercise using if-statement.

8. Programming Exercise using if-else statement.

9. Programming Exercise on switch statement.

10. Programming Exercise on do-while statement.

11. Programming Exercise on for statement.

12. Programming exercise on one-dimensional array and two-dimensional array.

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13. (i) Programs for putting two strings together (ii) Programs for comparing two strings.

14. Simple programs using structures and Union.

Diploma in Electronics & Communications Engineering (Semester-III)

DHU3002 PROFESSIONAL PRACTICES-II

Course Objectives : This course enables the students to:

1. Create analytical thinking through exposure to Industrial visits and learn to prepare reports on these visits.
2. Become industry/employment ready through exposure to recent technologies in the real world through Lectures by Professional / Industrial experts.
3. Critically think on a given topic after acquiring information through different sources, prepare PowerPoint presentations, and deliver seminars.
4. Analyse different Troubleshooting techniques for electrical and electronic equipment/instruments.
5. Perform a technical survey of electrical and electronic equipment/instruments.

Course Outcomes : After completion of the course, the learners will be able to:

1. Conclude through observations in an industrial environment.
2. Explore recent technologies in the real world through lectures by Professional / Industrial experts.
3. Apply knowledge acquired through various sources of information to make a meaningful presentation for delivering a seminar.
4. Analyse Troubleshooting approach for electrical and electronic equipment/instruments.
5. Analyse the pros and cons of electrical and electronic equipment/instruments of different make.

Module-I:

Field Visits: Structured field visits (minimum three) be arranged and report of the same should be submitted by the individual student, to form a part of the term work. The field visits may be arranged in the following areas / industries:
Power supply/UPS/SMPS/Inverter manufacturing unit, Electronics Instruments calibration laboratories, Residential building for Electronic security systems, Small hydro power station, Windmills.

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Module-II:

Lectures by Professional / Industrial Expert:(any four fields)
Non-conventional energy sources, Energy audit, Water pollution control, Software for P.C.B. layout, Mobile communication, Various government schemes, Industrial hygiene, Hydro power generation.

Module-III:

Seminar: Students (Group of 4 to 5 students) have to search /collect information about the topic through literature survey, visits and discussions with experts/concerned persons:
Students will have to submit a report of about 10 pages and deliver a seminar for 10 minutes on Any one of the topics: Water supply schemes/Problems of drinking water in rural area, Problems related to traffic control, Electronic rolling display, Electronic systems used in Multiplex, Any other suitable topic.

Module-IV:

Repair and maintenance of the following Items: CRO, Multimeter, UPS, Power supply.

Module-V:

Market Survey: A group of four students is expected to collect information from the market regarding specifications and cost of any four items: CRO, Multimeter, UPS, Power supply for brand name, specifications, cost and applications

Text Book:

1. Electronics Repair Manual, Gene B. Williams, Weka Publishing Inc., 1993
2. Troubleshooting and Maintenance of Electronic Equipments, Students Handbooks, Class XII, Central Board of Secondary Education.

Reference Study Material:

1. Equipment Maintenance and Repair in Laboratory Setting, Jimmy C. Santos, 2014

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SYLLABUS

SEMESTER-IV

Diploma in Electronics & Communications Engineering

w.e.f.2018

w.e.f. 2020

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Course Structure

Diploma in Electronics & Communications Engineering

Fourth Semester

Subject Code	Subject	Theory	Tutorial	Lab.	Credit
DEC 4011	Electronic Instruments and Measurement	3	0	0	3
DEC 4013	Analog Communication	3	1	0	4
DEC 4015	Linear Integrated Circuit	3	0	0	3
DEC 4017	Microprocessor and Its Applications	3	1	0	4
DAC 4001	Environmental Science	2	0	0	2
DEC 4012	Electronic Instruments & Measurement Lab.	0	0	2	1
DEC 4014	Analog Communication Lab.	0	0	2	1
DEC 4016	Linear Integrated Circuit Lab.	0	0	2	1
DEC 4018	Microprocessor Lab.	0	1	2	2
DCS 4012	Visual Basic Lab.	0	0	2	1
DHU 4002	Professional Practices-III	0	0	2	1
	Periods per week	**14**	**3**	**12**	-
	Total credits	-	-	-	**23**
	Total Periods per week	-	-	-	**29**

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Diploma in Electronics & Communications Engineering (Semester-IV)

DEC4011 ELECTRONIC INSTRUMENTS AND MEASUREMENTS

Course Objectives : This course enables the students to:

1. Understand the need and concept of measurement, errors, static and dynamic performance characteristics of measuring instruments, noise and analyze various a.c. and d.c. bridges for the measurement.
2. Demonstrate the operating principles of different digital instruments.
3. Explain the operation and construction of analog and digital CRO used for different parameter measurement in the department laboratory.
4. Solve the problems of measuring non electrical parameters using different transducers.
5. Understand the need and concept of signal processing, data acquisition and conversion.

Course Outcomes : After completion of the course, the learners will be able to:

1. Find and investigate errors and explain the static and dynamic characteristics of instruments, and demonstrate the process of balancing different bridge networks to find the value of unknown arm components.
2. Explain the working of different digital instruments.
3. Summarize the working and application of analog and digital CRO.
4. Schematize the measurement of non-electrical parameters using different transducers.
5. Explain different means of signal processing, data acquisition and conversion.

Module-I: **(7)**

Measurement and Measurement System: Performance characteristics of measurement- static and dynamic, Error and types of error, Noise, signal to noise ratio, noise figure, noise factor, Bridges- Whetstone's Bridge, Kelvin's Bridge, Maxwell's Bridge, Wien's Bridge.

Module-II: **(5)**

Digital instruments, digital voltmeters, digital multimeter, digital frequency meter, X-Y recorder, plotters, Digital waveform recorder/analyzer, spectrum analyzer, digital spectrum analyzer.

Module-III: **(6)**

Cathode Ray Oscilloscopes: Introduction, CRT, Measurement of voltage and frequency using CRO, Digital Storage Oscilloscopes, DSO applications.

Module-IV: **(6)**

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Transducers: Types, factors affecting selection of transducers, Principles of Resistive, Inductive and capacitive transducer, LVDT, Thermocouple, Thermistor, RTD, Piezoelectric, opto-electronic (Photo electric) transducers, strain gauge, gauge factor

Module-V: **(6)**

Data Acquisition and conversion: Analog signal processing, sample and hold operation, S/H circuits using OP-Amps, Data Acquisition System, Data Logger, Instrumentation amplifier, isolation amplifier, IEEE-488 GPIB Bus

Text Books:

1. Electrical & Electronic Measurements & Instrumentations by A.K. Sawhney, Dhanpat Rai & Co.
2. Electronic Instruments by Kalsi, Tata Mc Grow Hill

Reference Books:

1. Electronic Instrumentation & Measurement by David A Bell, Oxford University Press.
2. Student Reference Manual for Electronic Instrumentation laboratory by Stanley Wolf & Richard Smith, Prentice Hall.

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Diploma in Electronics & Communications Engineering (Semester-IV)

DEC4013 ANALOG COMMUNICATIONS

Course Objectives: This course enables the students to:

1. Understand to basics of signals, needs of modulation and multiplexing techniques.
2. Know the noise, types of noise and significance of noise equivalent band width.
3. Understand the different methods of modulation and demodulation of AM and DSB-SC signal.
4. Explain the methods of generation of SSB, VSB and their demodulation along with advantages and disadvantages.
5. Understand angle modulation, modulation and demodulation methods of FM, PM wave, concept of pre-emphasis and de-emphasis.

Course Outcomes: After completion of the course, the learners will be able to:

1. Demonstrate an understanding on communication system and representation of signals.
2. Explain the types of noise and significance of noise equivalent band width.
3. Explain the different methods of amplitude modulation and demodulation schemes, their design, operation and applications.
4. Demonstrate an understanding on different methods of SSB, VSB, their design, operation and applications.
5. Explain the concept of AM, FM & PM, their design, operation, comparison and applications.

Module-I: **(8)**

Communication Of Signals And Transmission Media -The communication process, sources of Information, Message and signals, classification of signals, elements of a communication system, Modulation, needs of modulation, Radio frequency spectrum, Types of transmission Media, Transmission Multiplexing schemes.

Module-II: **(8)**

Noise and Their Classification-Classification and origin of noise, thermal noise, white noise, shot Noise, noise equivalent bandwidth, noise temperature, signal in presence of noise, signal to noise ratio (SNR), noise figure, noise temperature, noise figure.

Module-III: **(8)**

AM Transmitter and Receivers - Generation of AM wave, low level and high level modulation, AM transmitter block diagram, Modulation and Demodulation of AM Waves. DSB-SC modulation, Generation of DSB-SC signals, Demodulation of DSB-SC signals.

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Tuned radio frequency (TRF) receiver, Super heterodyne receiver, Receiver parameters: sensitivity, selectivity, fidelity, tracking, image frequency and its rejection, IF amplifiers.

Module-IV: **(8)**

SSB Transmitters and Receivers - Generator of SSB: filter method, phase shift method. Demodulation of SSB: coherent detection method, advantages of SSB over DSB-FC.
Vestigial sideband transmission (VSB): advantages, Generation and Demodulation of VSB.

Module-V: **(8)**

FM Transmitter and Receivers -Mathematical representation of frequency and phase modulation, Narrow-band FM, wideband FM, transmission BW of FM waves. Generation of frequency modulated waves, Demodulation of FM waves, Pre-emphasis and de-emphasis, Comparison between AM, FM & PM.

Text Book:

1. Communication Systems, S. Haykin, Wiley India Pvt. Ltd, 4th Edition 2001, ISBN: 9971513056, 9789971513054
2. Communication Systems, R. P. Singh and S.D Sapre, Tata McGraw Hills Education Pvt. Ltd, 3rd Edition, 2012, ISBN: 9781259004605

Reference Book:

1. Analog Communication Systems, Sanjay Sharma, S.K. Kataria & Sons, 7th Edition, 2016, ISBN: 978-93-5014-379-7.
2. Modern Digital & Analog Communication System, 3rd Edition, B.P. Lathi, Oxford University Press , ISBN- 9780198073802, 0198073801.
3. Electronic Communication Systems, Kennedy & Davis, 4th Edition, McGraw Hill Education, ISBN-13. 978-0071077828.

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Diploma in Electronics & Communications Engineering (Semester-IV)

DEC4015 LINEAR INTEGRATED CIRCUITS

Course Objective: Student will be able:

1. To define the Op-amp characteristics and describe working principle of OP-AMP.
2. To design electronic circuit using OP-AMP for various mathematical operations.
3. To design electronic circuit using OP-AMP for industrial application.
4. To design active filters using op-amp.
5. To design electronic circuit using timer IC's and to analyze the response of frequency selective circuit such as PLL with respect to the incoming signal.

Course Outcomes:

After completion of the course, the students will be able to:

CO1	Understand Op-amp characteristics and working principle of OP-AMP.
CO2	Demonstrate the applications and circuits of circuit using OP-AMP for various mathematical operations
CO3	Demonstrate the applications and circuits of OP-AMP for industrial applications.
CO4	Understand Op-amp filter design procedures and response.
CO5	Understand circuit using timer IC's and analyze the response of frequency selective circuit such as PLL with respect to the incoming signal.

Module-I: **(5)**

Introduction to Operational Amplifier (OPAMP): Block diagram and functions (all stages), Equivalent Circuit, Circuit Symbols and Terminals, OPAMP IC's: 741 pin diagram and pin function. Definitions of parameters of op-amp- Input offset voltage, Input offset current, Input bias current, differential input resistance, Input capacitance, Input voltage range, offset voltage adjustment, CMMR, SVRR, large signal voltage gain, supply voltages, supply current, output voltage swing, output resistance, slew rate, gain bandwidth product, output short circuit current. Ideal op-amp: electrical characteristics.

Module-II: **(6)**

OPAMP basic circuits: Open loop and closed loop configuration of op-amp, its comparison, Virtual ground concept Open loop configuration – Inverting , Non-inverting, Close loop configuration– Inverting, non- inverting, differential amplifier, unity gain- amplifier(voltage follower), inverter(sign changer), Inverting & non-inverting configuration of Adders (summing amplifier, scaling Amplifier, averaging amplifier), Subtractor, Basic and Practical Integrator, Basic and Practical Differentiator, Basic concept of frequency compensation of op- amp and offset nulling, Numerical based on designing of above circuit.

Module-III: **(7)**

Applications of OPAMP: Need for signal conditioning and signal processing. Circuit diagram, operation, derivation of output voltage equation, advantages and applications of Instrumentation amplifier (using one two and three op-amps). Pin diagram pin functions and specifications of IC AD 524, LM 324 voltage to current converter (with floating load, with grounded load). Current to voltage converter, Sample and hold circuit (IC LF398 , Pin diagram specification and pin functions) Logarithmic and antilogarithmic amplifiers (using Diodes) Analog divider and analog multiplier, Concept of comparator: Comparators (ICLM301, LM310, 710 Pin diagram

specification and pin functions).

Module-IV: **(6)**

Filters: Introduction to filters, Classification of filters, Concept of passive & active filters, Merits & demerits of active filters over passive filters, Ideal and actual characteristics, terms: - cut off frequency, pass band, stop band, center frequency, roll off rate, BW, Q- factor, first order & second order Butterworth filters, Low pass filter, high pass filter, band pass filter(wide band pass , narrow band pass filter) Band reject filter(wide band reject, narrow band reject filter), all pass filter, Numerical based on design of different filters.

Module-V: **(6)**

Timers: Introduction to timer IC 555, Block diagram of IC 555 and its pin diagram & function of each pin, Concepts of different timer circuits used in industries: water level controller, Touch plate switch, frequency divider etc., IC 556 pin diagram and specifications. Designing of simple circuits and trouble shooting of these circuits, Numerical based on timers, Principle of operation, block diagram of PLL, Applications of PLL as frequency multiplier, FM demodulator, Pin diagram and pin functions of IC 565(PLL) and IC 566(VCO).

Text and Reference books:

1. Op-Amp & Linear Integrated Circuits by Ramakant A Gaikwad, Prentice-hall of India New Delhi.
2. Operational Amplifier with Linear Integrated Circuits by William D. Stanley, Pearson Education.
3. Design with OPAMP & analog integrated Circuits by Sergio Franco, Tata McGraw-Hill, New Delhi.

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Diploma in Electronics & Communications Engineering (Semester-IV)

DEC4017 MICROPROCESSOR AND ITS APPLICATION

OBJECTIVE: Student will be able to:

1. Perform arithmetic operations with help of a standard ALU design.
2. Describe the operational features of A/D and D/A converters.
3. Differentiate between the different types of memories and their applications.
4. Describe the basic architecture of a microprocessors based system.
5. Develop a minimum system with 8085 microprocessors.

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO1	Understand arithmetic operations with help of a standard ALU design.
CO2	Demonstrate the applications A/D and D/A converters.
CO3	Understand and identify the different types of memories and their applications.
CO4	Understand the basic architecture of a microprocessors based system.
CO5	Demonstrate a minimum system with 8085 microprocessors.

Module-I: **(6)**

Introduction: Organization and Block-Diagram of a Simple Micro-Computer, Word-length of a Computer/Microprocessors, Microcontrollers, Embedded Microprocessors, Hardware, Software, Firmware, CPU/Microprocessor – Schematic Diagram, Memory, Buses, Input device, Output device, Microprocessor Applications.

Introduction to 8085 – Microprocessor : Architecture, Pin-description, System Bus – Address Bus, Data Bus, Control Bus, Instruction Cycle, Timing-diagram.

Module-II: **(10)**

Instruction sets of Intel - 8085 : Addressing Modes, Groups of Instructions. Simple Programming on Addition, Subtraction, Multiplication, Counting, Looping, BCD to BINARY conversion, BINARY to BCD conversion, sorting etc.

Module-III: **(8)**

Peripheral Devices and their Interfacing : Address space partitioning – Memory mapped I/O Scheme, I/O mapped I/O scheme, Memory and I/O interfacing, Data-transfer schemes, Interrupts of Intel 8085, Brief Introduction to 8255, 8253. Interfacing of these chips with Microprocessor.

Module-IV: **(8)**

8259 Interfacing Chip: Pin description, interfacing of 8259 and I/O devices, Internal Register of 8259. **Introduction to 8086:** Pin-description, operating modes, pin –description for Minimum and Maximum mode, operation, Registers.

Module-V: **(8)**

Microprocessor Based Data Acquisition system: Analog to Digital converter, Digital to Analog converter. D/A-A/D Accuracy & Resolution, Interfacing DAC & ADC with microprocessor.

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Microprocessor Applications: Industrial Examples of Temperature Control and Pressure monitoring and their control.

Text and Reference books:

1. Fundamentals of Microprocessors & Microcontrollers – By – B. Ram
2. Digital Computer Electronics – By – Malvino, Brown.
3. Microprocessor Architecture, Programming & Applications – By – R.S.Gaonkar.

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Diploma in Electronics & Communications Engineering (Semester-IV)

DAC 4001ENVIRONMENTAL SCIENCE

Course Objective:

Students will be able to understand:

1. Importance of Environmental Science as well as biogeochemical cycles and food chain
2. Composition and function of various segments of environment
3. Water pollution, various pollutants, their toxic effects and water treatment process
4. Classification, toxic effects and sources of air pollutants and their control measures
5. Brief introduction to Noise Pollution, Soil Pollution and radiation pollution

Course Outcomes: After completing the course **s**tudents will be able to:

CO1	Understand Importance of environmental science and concept of ecology, biogeochemical cycle, and food chain
CO2	Understand composition and function of various segments of environment
CO3	Identify and Understand Water pollution, various pollutants, their toxic effects and water treatment process
CO4	Identify and Understand Classification, toxic effects and sources of air pollutants and their control measures
CO5	Identify and Understand Brief introduction to Noise Pollution, Soil Pollution and radiation pollution

Module I: **(6)**

Multidisciplinary nature of Environmental Science & Ecology: Definition & importance of Environmental Science. Ecosystem, basic structure of an ecosystem (abiotic and biotic components), nutrient and biogeochemical cycles (carbon cycle, nitrogen cycle, and hydrological cycle), food chain, food web.

Module II: **(3)**

Segments of environment: Atmosphere, hydrosphere, lithosphere, soil profile and composition of soil, biosphere.

Module III: **(6)**

Water Pollution & Waste water treatment : Water resources, sources of water pollution, various pollutants, their toxic effect, portability of water, rain water harvesting, primary and secondary waste water treatment (Trickling filter & Activated sludge process.

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Module IV: **(3)**

Air Pollution: Classification of air pollutants, toxic effects, sources and their control measures like ESP, catalytic converter and bag house filter.

Module V: **(2)**

Other Pollutions: A brief introduction to Noise Pollution, Soil Pollution and radiation pollution.

Text books:

1. A. K. Dey,"Environmental Chemistry"
2. Deswal & Deswal,"A basic course in Environmental studies"

Reference books:

1. B. K. Sharma,"Environmental pollution"
2. C. S. Rao, "Environmental pollution and control"

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Diploma in Electronics & Communications Engineering (Semester-IV)

DEC4012 ELECTRONIC INSTRUMENT AND MEASUREMENT LAB.

Course Objectives : This course enables the students to:

1. Understand the basics of CRO and Function Generator with the demonstration of their Front Panel Controls.
2. Illustrate applications of Function Generator, CRO, and DSO.
3. Illustrate the working of Analog to Digital Converter and Digital to Analog Converter.
4. Illustrate the applications of digital multimeter and use it in IC Temperature sensor output measurement.
5. Illustrate displacement measurement using LVDT and load measurement using Strain Gauge.

Course Outcomes : After completion of the course, the learners will be able to:

1. Examine the CRO and Function generator by operating their front panel controls.
2. Interpret the measurements of voltage and frequency using a function generator and CRO; and DSO.
3. Observe and interpret the outputs of Analog to Digital Converter and Digital to Analog Converter.
4. Observe the applications of the Digital Multimeter and measure the output of IC Temperature sensor.
5. Observe displacement measurement using LVDT and load measurement using Strain Gauge.

Syllabus: List of Experiments

Module- I: **4**

1. To study the front panel control of CRO.
2. To study the front panel control of the function generator.

Module- II: **4**

3. To apply the use of instruments Function Generator and CRO to measure the voltage and frequency of the signal.
4. To study the front panel controls of the Digital Storage Oscilloscope.

Module- III: **4**

5. To study and observe the output of a 4-bit digital-to-analog converter.
6. To study and observe the output of an 8-bit analog-to-digital converter.

Module- IV: **4**

7. To study the applications of the Digital Multimeter.
8. To observe the output Characteristic of IC temperature sensor (LM335).

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Module-V: **4**

9. To observe the output characteristics of the graph of the LVDT sensor.
10. To study the load measurement using the strain gauge trainer.

Text Book:

1. Electrical & Electronic Measurements & Instrumentations by A.K. Sawhney, Dhanpat Rai & Co.
2. Electronic Instruments by Kalsi, Tata Mc Grow Hill

Reference Book:

1. Modern electronics instrumentation and Measurement Techniques by Albert D. Helfrick and William D. Cooper, PHI
2. Transducers and Instrumentation by DVS Murty, PHI
3. Measurement Systems by Ernest O Deobelin, McGraw Hill Education

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Diploma in Electronics & Communications Engineering (Semester-IV)

DEC4014 ANALOG COMMUNICATIONS LAB.

Course Objectives: This course enables the students to:

1. Understand the signal for DSB AM generation.
2. Understand the de-modulation of AM wave using envelope detector & linear diode detector.
3. Understand the signals for the modulation and de-modulation of SSB signal.
4. Understand the signals for the modulation & de-modulation of FM wave.
5. Understand the Voice transmission with DSB/SSB AM transmission/reception.

Course Outcomes: After completion of the course, the learners will be able to:

1. Analyze the signal for DSB AM generation.
2. Observe the waveform for the de-modulation of AM wave using envelope detector & linear diode detector.
3. Observe the waveform for the modulation and de-modulation of SSB signal.
4. Observe the waveform of modulation & de-modulation of FM wave.
5. Analyze the Voice transmission with DSB/SSB AM transmission/reception.

List of Compulsory experiments:

1. Observation of signals for double side band AM generation.

2. Determination of modulation index from DSB AM wave.

3. Observation of signals for demodulation of AM wave using envelope detector.

4. Observation of signals for demodulation of AM wave using linear diode detector.
5. Observation of signals for modulation of SSB signal.

6. Observation of signals for demodulation of SSB signal.

7. Observation of signals for FM wave using Varactor Modulator.

8. To measure the frequency deviation and modulation index using FM wave.

9. Observation of signals for the demodulation of FM wave using PLL

10. Voice transmission with DSB/SSB AM transmission/reception

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Text Book:

1. Communication Systems, S. Haykin, Wiley India Pvt. Ltd, 4th Edition 2001, ISBN: 9971513056, 9789971513054
2. Communication Systems, R. P. Singh and S.D Sapre, Tata McGraw Hills Education Pvt. Ltd, 3rd Edition, 2012, ISBN: 9781259004605

Reference Book:

1. Analog Communication Systems, Sanjay Sharma, S.K. Kataria & Sons, 7th Edition, 2016, ISBN: 978-93-5014-379-7.
2. Modern Digital & Analog Communication System, 3rd Edition, B.P. Lathi, Oxford University Press , ISBN- 9780198073802, 0198073801.
3. Electronic Communication Systems, Kennedy & Davis, 4th Edition, McGraw Hill Education, ISBN-13. 978-0071077828.

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UNIVERSITY POLYTECHNIC
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Diploma in Electronics & Communications Engineering (Semester-IV)

DEC4016 LINEAR INTEGRATED CIRCUIT LAB.

COURSE OBJECTIVE: Student will be able:

1. To identify and connect an OP-AMP in inverting/non-inverting mode and describe the working principle of OP-AMP in each mode.
2. To design circuit using OP-AMP for mathematical operations for adding, subtracting and integration.
3. To design circuit using OP-AMP for differentiation, logarithmic and anti-logarithmic operations.
4. To design converters and active low-pass Butterworth filter using op-amp.
5. To design high- pass, band-pass, band-reject Butterworth filter using op-amp.

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO1	Understand OP-AMP in inverting/non-inverting mode.
CO2	Demonstrate the applications and circuits using OP-AMP adding, subtracting and integration.
CO3	Demonstrate the applications and circuits of OP-AMP for differentiation, logarithmic and anti-logarithmic operations.
CO4	Demonstrate active low-pass Butterworth filter using op-amp.
CO5	Demonstrate high- pass, band-pass, and band-reject Butterworth filter using op-amp.

List of experiments

MODULE I: **(2)**

1. Measurement of parameters of IC 741 (such as CMRR , SVRR, offset adjustment)
2. To assemble inverting and non-inverting amplifier and draw input output wave forms.

MODULE II: **(2)**

3. To assemble addition and subtraction of analog signal using OPAMP.
4. Observe output of active integrator for different types of input (sine and square)

MODULE III: **(2)**

5. Observe output of active differentiator for different types of input (sine and square)
6. To assemble logarithmic and antilogarithmic amplifier and verify its output.

MODULE IV: **(2)**

7. Plot the graph of input and output for V to I converter and I to V converter
8. Plot the frequency response of first order butterworth low pass filter.

MODULE V: **(2)**

9. Plot the frequency response of first order butterworth high pass filter.
10. Plot the frequency response of first order butterworth band pass filter/ band reject filter.

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Text and Reference books:

1. Op-Amp & Linear Integrated Circuits by Ramakant A Gaikwad, Prentice-hall of India New Delhi.
2. Operational Amplifier with Linear Integrated Circuits by William D. Stanley, Pearson Education.
3. Design with OPAMP & analog integrated Circuits by Sergio Franco, Tata McGraw-Hill, New Delhi.

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Diploma in Electronics & Communications Engineering (Semester-IV)

DEC4018 MICROPROCESSOR LAB.

Course Objectives **:** This course enables the students to:

1. List the various components and characteristics of each component in a 8085 Microprocessor, and commands for working on the experiment kit.
2. Understand the programming concepts of 8085 for efficient coding.
3. Write and explain algorithms and flowcharts for simple programs.
4. Explain examples for different addressing modes and no. of bytes for different instructions.
5. Write the code for a given requirement, execute the program, debug, and demonstrate that the program produces the required result/output.

Course Outcomes **:** After completion of the course, the learners will be able to:

1. Identify & explain the functionality of various components in an 8085 Microprocessor and work on experiment kit.
2. Explain the programming concepts of 8085 for efficient coding.
3. Write and explain algorithms and flowcharts for simple programs.
4. Explain examples for different addressing modes and no. of bytes for different instructions.
5. Write the code for a given requirement, execute the program, debug, and demonstrate that the program produces the required result/output.

Syllabus: List of Experiments

Module- I: **2**

1. Study of 8085 microprocessor training kit.

2. Basics of Assembly Language Programming.

Module- II: **2**

3. Write an ALP to add two 8-bit numbers; sum: 8 Bits.

4. Write an ALP to add two 8-bit numbers; sum: 16 Bits.

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Module- III: **2**

5. Write an ALP to subtract two unsigned numbers, store the result in memory location XX90H. How would you determine the result obtained is straight binary number or 2's complement? Verify with examples.

6. Write an ALP to add two 16-bit numbers; sum: 16 Bits or more.

Module- IV: **2**

7. Write an ALP to multiply two 8-bit numbers, product being of 16 bits.

8. (a)Write an ALP to arrange a data array in ascending order.

(b) Write an ALP to arrange a data array in descending order.

Module-V: **2**

9. Write an ALP for block transfer of data.

10. Register BC contains 2793H, and registers DE contain 3182H. Write an ALP to add these two 16-bit numbers and place the sum in memory locations 2050H & 2051H.

Text Book:

1. 8085 Microcontroller Training Kit manual.

2. Microprocessor Architecture, Programming & Applications – By – R. S. Gaonkar.

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Diploma in Electronics & Communications Engineering (Semester-IV)

DCS 4012 VISUAL BASIC LAB.

COURSE OBJECTIVE:

1. To introduce students to the concept of event-driven programming and the elements of Visual Basic programming environment.
2. To introduce them to user interface designing using Visual Basic controls.
3. To enable them use the built-in functions for processing numeric data and strings.
4. To enable them to use control statements to implement the desired programming logic.
5. To give them the knowledge about connecting their application to a database and storing data, and access the same for retrieving information and/or processing it.

COURSE OUTCOME:

After completing this course students should be able to:

1. Understand the concept of event-driven programming and use the elements of Visual Basic programming environment to develop simple applications.
2. Design user interface using various Visual Basic controls and program them to develop a complete application.
3. Use the built-in functions to process numeric data or strings for a given purpose.
4. Use control statements to implement the desired programming logic.
5. Connect their applications to a database for storing data, and access the same for retrieving information and/or processing it.

1. **Visual basic building blocks:**
   - Object, properties, events, forms, controls, modules, methods, input box and message box.
   - Form: Creating adding and removing forms in project: Add, remove, hide, show, load statement, unload statement, me keyword, Referring to objects on a different forms.
   - Data types, Variable, constant
2. **Working with Controls:**
   - Text box, label, command button, frame, list box, check box, radio button, file list box, drive list box, directory list box, timer, scroll bar control, picture box, image box, Menu editor.
3. **Inbuilt functions:**

   Mathematical function: Rnd, Sqr, Int, Abs, Exp, Log, Sin, Cos, Tan , Atn, Fix and Round.

   Format function and String: Tab, Space, and Format, String comparison: equals, compareto.
4. **Control statements:**

   If ……then, If…….then……else, If…….then……elseif…end if

   Looping: for….next, while…wend, do….while, do….until.

   Compound conditions: And , Or, Not; Select Case
5. **Database connecting tools:**

   ADODC, ADODB, Creating the database files for use by visual basic(using MS- Access), Data control and their properties, Adding a New Record, searching record, Updating a record, Deleting a record, Data grid

   Report generation: Data environment, creating query, preparing a report.

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Diploma in Electronics & Communications Engineering (Semester-IV)

DHU 4002 PROFESSIONAL PRACTICES-III

Course Objectives : This course enables the students to:

1. Create analytical thinking through exposure to Industrial visits and learn to prepare reports on these visits.
2. Become industry/employment ready through exposure to recent technologies in the real world through Lectures by Professional / Industrial experts.
3. Exploration of suitable technical topics through different means of information.
4. Critically think on a given topic after acquiring information through different sources, prepare PowerPoint presentations, and deliver seminars.
5. Analyse different Troubleshooting techniques for electrical and electronic equipment/instruments.

Course Outcomes : After completion of the course, the learners will be able to:

1. Conclude through observations in an industrial environment.
2. Explore recent technologies in the real world through lectures by Professional / Industrial experts.
3. Exploration of suitable technical topics through different means of information.
4. Apply knowledge acquired through various sources of information to make a meaningful presentation for delivering a seminar.
5. Analyse Troubleshooting approach for electrical and electronic equipment/instruments.

Module-I:

Field Visits: Structured field visits (minimum three) be arranged and report of the same should be submitted by the individual student, to form a part of the term work. The field visits may be arranged in the following areas / industries:
Electronic Equipment Manufacturing unit, Resistance Welding unit, Industrial Automation unit.

Module-II:

Lectures by Professional / Industrial Expert:(any four fields)
Cyber laws, Fiber optics communication system, Disaster management, Use of signals for
Telephone, television, internet, Industrial Safety, Computer security systems, any other suitable topic.

Module-III:

Information Search : Information search can be done through manufacturers, catalogue, internet, magazines; books etc. and submit a report. Following topics are suggested: Collection of information

about tools used in electronic workshop, Market survey for motors used in electronic application, Non-Conventional Energy Sources with focus on solar energy, Elevators installation and maintenance, any other suitable areas.

Module-IV:

Seminar: Seminar topic should be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes)

Module-V:

Maintenance of Electronic Equipment: Reliability Factors of equipments, Maintenance Management, Troubleshooting Procedures, Troubleshooting Aids.

Text Books:

1. Trouble Shooting Electronic Equipment by R.S. Khandpar, Tata McGraw Hill.

Reference Books:

1. Electronic Instruments & System by R.G. Gupta, Tata McGraw Hill.

w.e.f.2018

UNIVERSITY POLYTECHNIC
BIT MESRA, RANCHI

SYLLABUS

SEMESTER-V

Diploma in Electronics & Communications Engineering

w.e.f.2018

w.e.f. 2020

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Course Structure

Diploma in Electronics & Communications Engineering

Fifth Semester

Subject Code	Subject	Theory	Tutorial	Lab.	Credit
DEC 5009	Digital Communication	3	1	0	4
DEC 5011	Embedded System	3	1	0	4
DEC 5013	Advance Communication Systems	3	0	0	3
DEC 5015	Control Systems	3	1	0	4
DEC 5010	Digital Communication Lab.	0	1	2	2
DEC 5014	Embedded System Lab.	0	0	2	1
DEC 5016	Advance Communication Systems Lab.	0	1	2	2
DEC 5018	Control Systems Lab.	0	0	2	1
DEC 5012	Project-I	0	0	4	2
	Periods per week	**12**	**5**	**12**	-
	Total credits	-	-	-	**23**
	Total Periods per week	-	-	-	**29**

w.e.f.2018

UNIVERSITY POLYTECHNIC
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Diploma in Electronics & Communications Engineering (Semester-V)

DEC 5009 DIGITAL COMMUNICATIONS

Course Objectives: This course enables the students to:

1. Understand analog and digital communication system, channel capacity, entropy, Shannon-Hartley theorem, channel noise and its effect.
2. Understand Sampling theorem, Nyquist rate, aliasing, natural & flat top sampling, PAM, PWM, PPM, PCM, inter symbol interference, Delta modulation, slope overload, granular noise, ADM, DPCM.
3. Understand ASK, FSK, PSK and their Tx and Rx block diagram, M-ary encoding, QPSK, QAM, DPSK.
4. Understand Baud rate, Bit rate, Line coding - unipolar, bipolar – NRZ, RZ, Manchester, Source coding, ASCII, EBCDIC and baudot code, Channel coding, error detection & correction using parity, Hamming code.
5. Understand Multiplexing, TDM, FDM, Introduction to WDM, TDMA, FDMA, CDMA, advantages of TDMA over FDMA, spread spectrum modulation.

Course Outcomes: After completion of the course, the learners will be able to:

1. Demonstrate the concept of channel capacity, entropy and Shannon-Hartley theorem.
2. Explain the different types of sampling scheme, concept of delta modulation and PCM.
3. Design and develop the different digital modulation schemes.
4. Apply the concept of different encoding scheme and find the error detection and correction using parity.
5. Explain the concept of different Multiplexing scheme and spread spectrum modulation.

Module- I: **(6)**

Introduction Of Digital Communication: Basic digital communication system, block diagram, Channel capacity-definition, Hartley's law, Shannon-Hartley theorem, Channel capacity equation, channel noise and its effect, entropy, Advantages and disadvantages of digital communication.

.

Module-II: **(10)**

Pulse Communication: Introduction, comparison with Continuous Wave Modulation, advantages, Sampling theorem, Nyquist rate, aliasing, natural & flat top sampling, PAM, PWM, PPM definition, generation, block diagram, waveform analysis, and their comparison, Pulse code modulation- block diagram of PCM transmitter & receiver, sampling quantization, quantization error, companding, inter symbol interference, Delta modulation- block diagram of DM, slope overload, granular noise, ADM, DPCM, block diagram and working.

.

Module- III: **(8)**

Digital Modulation Techniques: ASK, FSK, PSK definition & waveforms, their transmitter and receiver block diagram and working, M-array encoding, QPSK, QAM, DPSK block diagram of transmitter and receiver and working, Bandwidth for each modulation technique and their comparison.

w.e.f. 2018

Module- IV: **(8)**

Coding Methods And Error Control: Baud rate, Bit rate, Line coding - unipolar, bipolar – NRZ, RZ, Manchester, Source coding, ASCII, EBCDIC and baudot code, Channel coding, Error, Causes of error and its effects, error detection & correction using parity, Hamming code & simple numerical.

Module-V: **(8)**

Multiplexing And Multiple Accesses: Need of Multiplexing, TDM, FDM definition block diagram and their comparison, Introduction to WDM, Access technique TDMA, FDMA, CDMA (only concepts), advantages of TDMA over FDMA. Introduction to spread spectrum modulation.

.

Text Book:

1. Electronic Communication System, Wayne Tomasi, Pearson Education, Sixth Edition. Edition, ISBN: 10: 1-292-02735-5, 13: 978-1-292-02735-7
2. Digital Communication, Amitabha Bhattacharya, Tata McGraw Hill, 2006 ISBN: 9780070591172, 9780070591172
3. Digital & Analog Communication, K. Sam Shanmugar, Jhon wiley & sons, 2006 ISBN: 13: 978-8126509140

Reference Book:

1. Digital Communication Fundamentals & Applications, B. Sklar & fred harris, 3rd edition Pearson Education, 2021. ISBN: 13: 978-0-13-458856-8, 10: 0-13-458856-8
2. Digital Communication, Sanjay Sharma, S.K. Kataria & Sons, 2013, ISBN-10. 9350142686, 13. 978-9350142684

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Diploma in Electronics & Communications Engineering (Semester-V)

DEC 5011 EMBEDDED SYSTEM

Course Objectives **:** This course enables the students to:

1. Understand Microcontroller series (MCS)–51 Overview: Architecture, Pin Details, I/O Ports, Memory, and Special Function Registers (SFRs)
2. Understand INTEL 8051 Instruction Set, Addressing Modes, Instruction types: Timer operation, Serial Port operation, and Interrupts
3. Understand Assembly/C programming tools for Microcontroller
4. Explain design and interfacing of keypad interface, 7- segment interface, LCD, stepper motor, A/D, D/A, RTC interface.
5. Understand the introduction of PIC Microcontrollers, Application of Micro-controllers in Communication System.

Course Outcomes **:** After completion of the course, the learners will be able to:

1. Explain INTEL 8051/8031 Architecture, Pin Details, I/O Ports, Memory, and Special Function Registers (SFRs).
2. Explain INTEL 8051 Instruction Set, Addressing Modes, Instruction types: Timer operation, Serial Port operation, and Interrupts
3. Explain Assembly/C programming tools for Microcontroller
4. Explain design and interfacing of keypad interface, 7- segment interface, LCD, stepper motor, A/D, D/A, RTC interface.
5. Explain the introduction of PIC Microcontrollers, Application of Micro-controllers in Communication System

Module- I: **(8)**

Microcontroller series (MCS) – 51 Overview: Architecture of 8051/8031 Microcontroller, Pin details, I/O Port structure, Memory Organization, Special Function Registers (SFRs), External Memory.

Module- II: **(10)**

Introduction to Intel 8051: Instruction Set; Addressing Modes, Instruction types: Timer operation, Serial Port operation, Interrupts.

Module- III: **(8)**

Assembly/C programming for Micro controller: Assembler directives, Assembler operation, Compiler operations, De bugger, Simulator.

Module- IV: **(8)**

Design and Interface: Examples like: keypad interface, 7- segment interface, LCD, stepper motor, A/D, D/A, RTC interface.

Module-V: **(6)**

Applications: Introduction of PIC Micro controllers, Application of Micro controllers in

Communication System.

w.e.f. 2018

Text Book:

1. The 8051 Microcontroller by Kenneth J. Ayala, THOMSON, Cengage Learning, Third Edition, ISBN: 140186158X, 9781401861582

2. Microcontrollers (Theory and Applications) by Ajay V. Deshmukh, McGraw-Hill Education (India) Pvt Limited, 2005, ISBN: 0070585954, 9780070585959

Reference Book:

1. The 8051 Microcontroller and Embedded Systems by Md. Ali Mazidi, Pearson Education India, 2007, ISBN: 8131758990, 9788131758991

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Diploma in Electronics & Communications Engineering (Semester-V)

DEC 5013 ADVANCE COMMUNICATION SYSTEMS

Course Objective: Student will be able to:

1. Identify Microwave spectrum (frequency) and learn the concept of electromagnetic waveguides.
2. Identify different microwave components.
3. Recognize different modes of wave propagation.
4. Study the various aspects of Radar Communication.
5. Study various functional blocks and subsystems of Satellite Communication.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Understand the concept of electromagnetic waveguides.
CO2 Understand Identify different microwave components.
CO3 Recognise and understand the different modes of wave propagation.
CO4 Comprehend the details and applications of radar communication.
CO5 Comprehend the details and applications of satellite communication.

Module-I: **(8)**

Wave Guide: Microwave Region and Band Designations, Introduction to TEM/TE/TM/HE wave destination, Comparison of wave guide with two wire transmission line, Propagation of waves in rectangular wave guide only.(Introduction to wave guide only), TE & TM Modes in rectangular wave guide with field pattern. Concept of dominant mode, Definition and interpretation of cut off frequency of a waveguide, guide wave length, phase velocity, group velocity(Simple Numerical).

Module-II: **(8)**

Microwave Components: Construction , working Principles & Applications of : Multicavity klystron amplifier, Reflex Klystron amplifier, Travelling wave tube, Magnetron, Construction working principle & Application, PIN Diode & Gunn Diode; Construction, Working principle & application of H-plane Tee, E-Plane Tee, E-H Plane TEE, Multihole directional coupler, wave guide, bends, corners, Twists, circulator, Isolator.

Module-III: **(8)**

Microwave Communication Systems: Microwave Communication, Mode of Wave Propagation, Range of LOS Microwave Systems, Concept of Effective Earth's Radius, Duct Propagation (Super Refraction), Microwave Antennas.

Module-IV: **(8)**

Radar Theory: Fundamentals: Basic concept of Radar, Radar Range equation, factors influencing maximum range, Block diagram of an elementary pulsed Radar, Duplexer concept, Antenna & Scanning (Antenna Scanning & Tracking), display methods. Principle of MTI Radar, Block diagram and explain the operation of MTI radar, Concept of continuous Wave Radar (Modulated & Un-Modulated), Doppler effect. Advantages, Disadvantage and application of CWR. Radar Beacons.

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Module-V: **(8)**

Satellite Communication: Block diagram of elements of a satellite Communication system, Orbital pattern of Satellite (Elliptical orbit, Parabolic orbit and geo stationary orbit), Advantages of geo stationary satellite, Satellite links (uplink, down link, cross link), look angle, angle of elevation, azimuth angles, Uplink and downlink frequency bands used in satellite Communication, foot print and station keeping, Block diagram of Satellite earth stationary, Block diagram of satellite subsystems, Functions of a satellite -Power subsystem (only concept), Solar ECLIPSE; Telemetry, tracking & Command; Altitude & Orbit Control System. Communication Channel subsystem (Block diagram of typical transponder).

Text books:

1. Microwave Devices and Circuits by Samuel Liao, Prentice Hall of India
2. Microwave and Radar Engineering by A K Gautam, S. K. Kataria & Sons

Reference books:

1. Microwave Engineering by David Pozar, John Wiley and Sons.

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Diploma in Electronics & Communications Engineering (Semester-V)

DEC 5015 CONTROL SYSTEMS

Course Objectives : This course enables the students to:

1. Explain open and closed loop control systems, application of Laplace Transform, and Mathematical modeling of physical systems.
2. Analysis of Linear system using transfer function concept.
3. Explain the time domain analysis to understand the behavior of linear systems.
4. Analyze the system using Frequency domain approach.
5. Explain control actions of control elements.

Course Outcomes : After completion of the course, the learners will be able to:

1. Explain open and closed loop control systems, application of Laplace Transform, and Mathematical modeling of physical systems.
2. Analysis of Linear system using transfer function concept.
3. Explain the time domain analysis to understand the behavior of linear systems.
4. Analyze the system using Frequency domain approach.
5. Explain control actions of control elements.

Module- I: **(10)**

Introduction to Control Systems: Introduction to Laplace Transform of different function, Inverse Laplace Transform, Use of Laplace Transform to solve differential equation, simple RL, RC and RLC circuit and their analysis using Laplace Transform.

Introduction to control system, open loop and closed loop systems with suitable examples, Mathematical Modeling of physical systems.

Module- II: **(8)**

Control system Representation: Definition of Transfer function, Different types of transfer function, Transfer function of Electrical systems, Transfer function of single input and single output system.

Block diagram representation and reduction techniques, Signal Flow Graph, Mason's gain formula.

Module- III: **(8)**

Time response Analysis: Standard test signals, Concept of Impulse Response, Response of first and second order system to step input, Time Response specification, Types of systems, Steady- state error and error constants for step, ramp and acceleration input.

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Module- IV: **(9)**

Stability & frequency response analysis: Definition of stable, unstable and limitedly stable system, Response terms of various natures of roots, Relative stability, Routh's stability criterion and its application for feedback systems.

Frequency response and frequency specifications, Correlation between time response and frequency response, Bode Plot, Gain Margin and Phase Margin, Polar Plot

Nyquist stability criterion: Principle of Argument, Conformal mapping, Nyquist stability criterion, Application of Nyquist criterion for first three types of transfer function.

Module-V: **(5)**

Control Actions: Discontinuous & continuous modes; on-off controllers: neutral zone, proportional controllers (offset, proportional band), integral & derivative controllers; PI, PD, PID controllers, DC Servo motor, AC servo motor, Potentiometer, AC Synchro: Transmitter and Receiver, Stepper Motor.

5

Text Book:

1. Control Systems Engineering, I. J. Nagrath, M. Gopal, New Age International Private Limited, 7th Edition, ISBN: 978-8195175581.
2. Control System: Theory and Applications, Smarajit Ghosh, Pearson Education India, 2nd Edition, ISBN: 978-8131708286

Reference Book:

1. Automatic Control System, Benjamin C. Kuo, Farid Golnaraghi, John Wiley & Sons, 9th Edition, Isbn: 978-8126552337.
2. Modern Control Engineering, Katsuhiko Ogata, Pearson, 5th Edition, ISBN: 978-0136156734
3. Control System By Ogata

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Diploma in Electronics & Communications Engineering (Semester-V)

DEC 5010 DIGITAL COMMUNICATIONS LAB.

Course Objectives: This course enables the students to:

1. Understand the signal sampling and reconstructed the wave form using sample / hold circuit.
2. Understand the PAM, PWM, PPM modulation and de-modulation.
3. Understand the pulse code modulation and de-modulation..
4. Understand the delta modulation, adaptive delta modulation and de-modulation
5. Understand the ASK, FSK, PSK and different multiplexing techniques.

Course Outcomes: After completion of the course, the learners will be able to:

1. Analyze the signal sampling and its reconstruction
2. Design the generation and detection of various waveforms such as PAM, PWM and PPM.
3. Design and develop the pulse code modulation and de-modulation.
4. Analyze the waveform of delta modulation, adaptive delta modulation and de-modulation.
5. Observe the waveform of ASK, FSK, PSK and design the different Multiplexing scheme.

List of Compulsory experiments:

1. Observe the signal sampling and reconstruct techniques
2. Observe the effect on reconstructed wave form using sample / hold circuit.
3. To compare the frequency response of 2^{nd} order and 4^{th} order of LPF.
4. Observe waveforms of Pulse Amplitude modulation and demodulation.
5. Observe waveforms of Pulse width modulation (using natural sampling & flat top sampling)
6. Observe waveforms of Pulse Position modulation (using natural sampling.
7. Observe waveforms of Pulse code modulation and demodulation.
8. Observe waveforms of Delta modulation.
9. Observe waveforms of Adaptive delta Modulation.
10. Observe waveforms of ASK modulation & demodulation.
11. Observe waveforms of FSK modulation & demodulation.
12. Observe waveforms of PSK modulation & demodulation.

List of Optional experiments:

1. Observe waveforms of QPSK modulation & demodulation.
2. Observe waveforms of QAM modulation & demodulation.
3. Error detection & correction using parity bits.
4. Error detection & correction using hamming codes
5. To generate following different line codes and decode them.
   a. NRZ (Unipolar) b. Bipolar NRZ c. RZ (Unipolar) d. Bipolar RZ
6. Time division multiplexing/ de multiplexing system.
7. Frequency division multiplexing/ de multiplexing system.

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Text Book:

1. Electronic Communication System, Wayne Tomasi, Pearson Education, Sixth Edition. Edition, ISBN: 10: 1-292-02735-5, 13: 978-1-292-02735-7
2. Digital Communication, Amitabha Bhattacharya, Tata McGraw Hill, 2006 ISBN: 9780070591172, 9780070591172
3. Digital & Analog Communication, K. Sam Shanmugar, Jhon wiley & sons, 2006 ISBN: 13: 978-8126509140

Reference Book:

1. Digital Communication Fundamentals & Applications, B. Sklar & fred harris, 3rd edition Pearson Education, 2021. ISBN: 13: 978-0-13-458856-8, 10: 0-13-458856-8
2. Digital Communication, Sanjay Sharma, S.K. Kataria & Sons, 2013, ISBN-10. 9350142686, 13. 978-9350142684.

w.e.f.2018

UNIVERSITY POLYTECHNIC
BIT MESRA, RANCHI

Diploma in Electronics & Communications Engineering (Semester-V)

DEC 5014 EMBEDDED SYSTEM LAB.

Course Objectives : This course enables the students to:

1. List the various components, and characteristics of each component in a 8051 Microcontroller, and commands for working on the experiment kit.
2. Understand the programming concepts of 8051 for efficient coding.
3. Write and explain algorithms and flowcharts for simple programs.
4. Explain examples for different addressing modes, and no. of bytes for different instructions.
5. Write the code for a given requirement, execute the program, debug, and demonstrate that the program produces the required result/output.

Course Outcomes : After completion of the course, the learners will be able to:

1. Identify & Explain the functionality of various components in a 8051 Microcontroller and work on experiment kit.
2. Explain the programming concepts of 8051 for efficient coding.
3. Write and explain algorithms and flowcharts for simple programs
4. Explain examples for different addressing modes, and no. of bytes for different instructions.
5. Write the code for a given requirement, execute the program, debug, and demonstrate that the program produces the required result/output.

List of Experiments

Module- I: **4**

1. Study of microcontroller INTEL 8051 Training Kit.
2. Write and execute an assembly language program for 8-bit addition.

Module- II: **4**

3. Write and execute an assembly language program for 8- bit subtraction.
4. Write and execute an assembly language program for 8- bit multiplication.

Module- III: **4**

5. Write and execute an assembly language program for 8- bit division.
6. Write and execute an assembly language program for BCD multiple byte arithmetic operation.

Module- IV: **4**

7. Simulation of Blinking LED using 8051 microcontroller using Virtual Lab.
8. Interfacing of 7-segment display with 8051 microcontroller using Virtual Lab

Module-V: **4**

9. Interfacing of ADC and DAC with 8051 microcontroller using Virtual Lab.
10. Interfacing of DC Motor with 8051 microcontroller using Virtual Lab.

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Text Book:

1. 8051 Microcontroller Training Kit manual.

2. The 8051 Microcontroller by Kenneth J. Ayala, THOMSON, Cengage Learning, Third Edition, ISBN: 140186158X, 9781401861582

3. Microcontrollers (Theory and Applications) by Ajay V. Deshmukh, McGraw-Hill Education (India) Pvt Limited, 2005, ISBN: 0070585954, 9780070585959

Reference Book:

1. The 8051 Microcontroller and Embedded Systems by Md. Ali Mazidi, Pearson Education India, 2007, ISBN: 8131758990, 9788131758991

2. Scott MacKenzie and Raphael C.W. Phan. The 8051 Microcontroller. (4/e), Pearson education, 2008.

Virtual Lab

www.vlabs.iitb.ac.in/vlabs-dev/labs/8051-Microcontroller-Lab/labs

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Diploma in Electronics & Communications Engineering (Semester-V)

DEC 5016 ADVANCE COMMUNICATION SYSTEMS LAB.

Course Objective: Student will be able to:

1. Identify different microwave components.
2. Understand the functions and requirements of Tee, Circulators and Isolators.
3. Study the characteristics of various microwave oscillators.
4. Study the gain characteristics of a horn antenna.
5. Study waveguide characteristics of X-Band Rectangular Waveguide.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Identify and understand the applications of different microwave components.
CO2 Demonstrate the functions and applications of Tee, Circulators and Isolators.
CO3 Demonstrate the functions and applications of microwave oscillators.
CO4 Demonstrate the gain characteristics of a horn antenna.
CO5 Demonstrate the waveguide characteristics of X-Band Rectangular Waveguide.
.

List of experiments:

1. Study of passive components.
2. Verification of characteristics E Plane Tee.
3. Verification of characteristics of Isolator.
4. Verification of characteristics of Circulator.
5. Indirect measurement of frequency using cavity resonator.
6. Measure the coupling factor of MHD Coupler.
7. Verification of the square law characteristics of a VHF crystal oscillator
8. V-I Characteristics of a Gunn Diode.
9. Determination of gain of a pyramidal Horn Antenna.
10. Determination of waveguide characteristics of X-Band Rectangular Waveguide.

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UNIVERSITY POLYTECHNIC
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Diploma in Electronics & Communications Engineering (Semester-V)

DEC 5018 CONTROL SYSTEMS LAB.

Course Objectives : This course enables the students to:

1. To outline and explain
   • Basic components used in control system
   • Specifications used for a system in time domain and frequency domain
2. To illustrate performance characteristics of DC motor, AC Servomotor, PID controller and compensating networks.
3. To apply comprehensive knowledge of techniques used to analyse system and solve problems.
4. Understand basics of MATLAB commands and Programming
5. Write the code for a given control system requirement, execute the program, debug, and demonstrate that the program produces the required result/output.

Course Outcomes : After completion of the course, the learners will be able to:

1. Examine the performance, essential basic components of a system and describe various specifications used for a system.
2. clearly explain and interpret the performance characteristics of DC motor, AC Servomotor, and PID Controller.
3. Capable of establishing the relation between time domain and frequency domain techniques.
4. Write and explain simple MATLAB programs.
5. Write the code for a given control requirement, execute the program, debug, and demonstrate that the program produces the required result/output.

List of Experiments

Module- I: **4**

1. To study ON/OFF Temperature Control.
2. To observe the input-output characteristics of Low-Pass and High Pass Filter.

Module- II: **4**

1. To study the first order and second order system.
2. To study the potentiometer error detector.

Module- III: **4**

1. Write and execute MATLAB program for Laplace transform of a given exponential.
2. Write and execute MATLAB program for Transfer Function and Pole-zero plot.

Module- IV: **4**

1. Write and execute MATLAB program for Block diagram reduction.
2. Write and execute MATLAB program for Unit step response and time response analysis.

Module-V: **4**

1. Write and execute MATLAB program for Calculation of error coefficients.
2. Write and execute MATLAB program for finding out roots of characteristic equation and Bode plot.

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Text Book:

1. Control Systems Engineering, I. J. Nagrath, M. Gopal, New Age International Private Limited, 7th Edition, ISBN: 978-8195175581.

2. Control System: Theory and Applications, Smarajit Ghosh, Pearson Education India, 2nd Edition, ISBN: 978-8131708286

Reference Book:

1. Automatic Control System, Benjamin C. Kuo, Farid Golnaraghi, John Wiley & Sons, 9th Edition, ISBN: 978-8126552337.

2. Modern Control Engineering, Katsuhiko Ogata, Pearson, 5th Edition, ISBN: 978-0136156734

w.e.f.2020

UNIVERSITY POLYTECHNIC
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SYLLABUS

SEMESTER-VI

Diploma in Electronics & Communications Engineering

w.e.f. 2018

w.e.f. 2020

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Course Structure
Diploma in Electronics & Communications Engineering

Sixth Semester

Subject Code	Subject	Theory	Tutorial	Lab,	Credit
DMT 6001	Total Quality Management	3	0	0	3
DEC 6009	Industrial Instrumentation	3	0	0	3
DCS 6003	Computer Hardware	3	1	0	4
DCS 6007	Computer Networks and Security	3	0	0	3
	Elective-I	3	0	0	3
	Elective-II	3	0	0	3
DEC 6014	Industrial Instrumentation Lab,	0	0	2	1
DCS 6004	Computer Hardware Lab,	0	0	2	1
DCS 6008	Computer Networking Lab,	0	0	2	1
DEC 6012	Project-II	0	0	6	3
List of Elective-I(Any one)					
DEC 6011	Wireless and Mobile Communication	3	0	0	3
DEC 6013	Telematics	3	0	0	3
DME 6015	Mechatronics	3	0	0	3
DEC 6015	VLSI Design	3	0	0	3
List of Elective-II(Any one)					
DEC 6017	Medical Electronics	3	0	0	3
DEC 6103	Optical Fibre Communication	3	0	0	3
DCS 6017	Internet of Things	3	0	0	3
	Periods per week	**18**	**1**	**12**	**-**
	Total credits	**-**	**-**	**-**	**25**
	Total Periods per week	-	-	-	**31s**

w.e.f. 2018

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Diploma in Electronics & Communications Engineering (Semester-VI)

DMT 6001 TOTAL QUALITY MANAGEMENT

OBJECTIVE

1. To understand the principles of Total Quality Management (TQM).
2. To identify various components of TQM.
3. To be acquainted with various quality standards.
4. To understand the need for benchmarking and its process, and various quality improvement techniques.
5. To understand the importance of quality circle and identify various issues related with it.

Course Outcomes:

After completion of the course, the students will be able to:

CO1	Understand the of Total Quality Management (TQM).
CO2	Identify various components of TQM.
CO3	Recognise and realize various quality standards.
CO4	Understand the need for benchmarking and its process, and various quality improvement techniques.
CO5	Understand the importance of quality circle and identify various issues related with it

Module-I: **(6)**

Introduction: - Management Concept, Function or Process, Characteristics of Management.
Total Quality Management Concept, Objective, Scope, Principles of TQM, Evolution of TQM, Difference of Quality Vs Total Quality Management.

Module-II: **(6)**

Components of Total quality Management: Customer Supplier Relationship in TQM System, Managerial Role in TQM, Value, vision, mission and goals in TQM.
Practices for TQM: TQM and Human Resource Development, Need and Significance of TQM, Process of TQM.

Module-III: **(6)**

Quality Management Systems: -Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality system Documentation, ISO 14000 – Concept, Requirements and Benefits.

Module-IV: **(6)**

Benchmarking – Introduction, Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD), Cost of Quality, QFD Process. Six- Sigma.

Module-V: **(6)**

Quality Circle: - Purpose, Benefits, Problem in implementation of quality circles, Requirements of effective quality Circle.

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Text Books:

1. Feigenbaum.A.V. "Total Quality Management, McGraw-Hill, 1991.

2. Total Quality Management,Pricnciples & Practice- S.K.Mandal.Vikas Publishing House Pvt Ltd.

3. Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd., Oxford. 1989.

Reference Books:

1. 4. Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International 1996.
2. Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991.
3. Total Quality Management, - Dr. S. Kumar 2011. Laxmi Publications Pvt. Ltd.

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UNIVERSITY POLYTECHNIC
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Diploma in Electronics & Communications Engineering (Semester-VI)

DEC6009 INDUSTRIAL INSTRUMENTATION

Course Objective: Student will be able to:

1. Explain the construction and working of instruments which control the various parameters and operations in any industry,
2. Identify and recognize the recent developments in instrumentation.
3. Understand and identify the elements of control in instruments.
4. Design, modify and troubleshoot PLC based control circuits.
5. Understand the need and applications of Distributed control system.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Recognise the various transducers and their scope of applications.
CO2 Appreciate and comprehend the recent developments in instrumentation.
CO3 Understand and apply the elements of control in instruments.
CO4 Design, modify and troubleshoot PLC based control circuits.
CO5 Understand and apply Distributed control system.

Module-I: **(8)**

Transducers: Introduction, Definition and nature, Transducer functions, Characteristics of transducers, Transducer classification, Displacement / Motion transducer, Temperature transducers, Pressure transducers, Liquid level transducers, Intelligent sensors, Bio Sensors.

Module-II: **(6)**

Recent developments in instrumentation and measurements: Computer-aided measurements, Fiber optic transducers, Microsensors, Smart Sensors, Smart transmitters and Field Bus, Virtual Instrumentation.

Module-III: **(5)**

Final Control Element: Introduction**,** Pneumatic actuation, Hydraulic actuation, Electric Actuation, Motor Actuators, Control Valves.

Converters: I/P converter, P/I Converter.

Module-IV: **(6)**

Programmable Logic Controllers: Introduction to Microcomputers, Programmable controllers, Programmable Logic Controllers, PLC programming, Ladder diagram, PLC Communications and Networking, PLC selection, PLC installation, Advantages of using PLC.

Module-V: **(5)**

Distributed Control System: Introduction, Overview of distributed control, DCS Software configuration, DCS Communication, DCS Supervisory Computer tasks, DCS Integration with PLCs and Computers, Features of DCS, Advantages of DCS.

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Text books:

1. Computer based industrial control by Krishnakant
2. Instrumentation Measurement and Analysis by BC Nakra and K K Chaudhry

Reference books:

1. Industrial Instrumentation and Control by S, K, Singh

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Diploma in Electronics & Communications Engineering (Semester-VI)

DCS 6003 COMPUTER HARDWARE

Course Objective:

1. To know various components used inside motherboard.
2. Students will be acquainted with the technologies used in modern microprocessor.
3. Develop understanding of construction & working of various types of memory used inside digital computer.
4. Develop understanding of working of SMPS and UPS.
5. Understand basics of various types of printer, preventive and corrective maintenance.

Course Outcomes:

After completing this course students should be able to:

1. Describe and distinguish the architecture of different motherboards based on form factors, chipset, processor socket, expansion slots.
2. Describe the features of microprocessors, understand their evolution, and identify modern technologies such as 64-bit architecture, hyper-threading, multi-core processing, turbo boost, and smart cache.
3. Identify the physical packaging and characteristics of various memory modules, and understand various hard disk interfaces.
4. Recognize power problems, understanding EMI and ESD issues, and understand the working of SMPS and UPS.
5. Understand the working of individual computer peripherals, and troubleshoot common pc problems and also perform preventive maintenance for PCs.

Module-I: **(8)**

Motherboard:
Motherboard form factors; Layout of motherboard; Components of motherboard ─ chipset, processor socket, expansion slots, power supply connectors, ROM BIOS, CMOS, ports etc.

Module-II: **(8)**

Microprocessor:
Processor Specification, FSB; Evolution of Processor; Modern Microprocessor technology- 64 bit architecture, Hyper-Threading, Multi-core processor, Turbo boost, Smart cache.

Module-III: **(8)**

Memory:
Logical memory Configuration─ Conventional memory, UMA, Extended Memory & Expanded Memory; Memory Physical Packaging; SIMM, DIMM & RIMM memory modules; Memory Banks; Types of Dynamic RAM─ FPM, EDO, BEDO, SDRAM, RD RAM, DDR RAM. Magnetic Storage: Hard Drives─ Hard Drive Construction and Interfaces. File System.

Module-IV: **(8)**

Power Supply:

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Power Problems─ Spike, Surge, Brownout and Blackout; EMI (Electromagnetic Interference); ESD; SMPS─ SMPS form factors, connectors and voltages; UPS─ Purpose of UPS, SPS and Double conversion UPS.

Module-V: **(8)**

Printer, Preventive Maintenance & Troubleshooting:
Printer: Working of Dot matrix printer, Inkjet printer and Laser printer**;** Maintenance and Troubleshooting: Preventive Maintenance ─ HDD, CDROM, Viruses detection and Protection; Steps of Logical Troubleshooting, common PC problems.

Text book:

1. Ron Gilster, "PC Hardware: A Beginner's Guide", TMH
2. C.A.Schmidt, "The Complete Computer Repair Textbook", 3e, Dreamtech

Reference book:

1. David Groth, "A+ Complete Study Guide", 3e

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Diploma in Electronics & Communications Engineering (Semester-VI)

DCS 6007 COMPUTER NETWORKING & SECURITY

COURSE OBJECTIVES:

1. To provide a strong foundation in network fundamentals including topologies, devices, and transmission techniques.
2. To provide students an overview of OSI and TCP/IP models and the role of physical and data link layers.
3. To provide students knowledge of the Network Layer and various routing algorithms and congestion control strategies.
4. To provide students knowledge of the Transport Layer and Application Layer protocols and services
5. To introduce students to fundamental concepts of network security and cryptography, and emphasize the threats to network security.

COURSE OUTCOMES

After completing this course students should be able to:

1. Develop a strong foundation in computer network fundamentals related to topologies, devices, and transmission techniques.
2. Understand the different layers in the OSI and TCP/IP models and role of physical and data link layers.
3. Understand the role of the Network Layer and get an idea of various routing algorithms and congestion control strategies.
4. Gain knowledge of the Transport Layer and Application Layer protocols and services.
5. Grasp the fundamental concepts of network security and cryptography, and understand the activities leading to security threats in a network.

Module-I: **(6)**

Network Fundamentals:

Network Topology: Bus, Ring, Star, Mesh; Network devices: Ethernet card, Hub, Switch, Bridge, Router; Addressing: Physical address, Logical address, Classes of IP address, Subnet Mask; Terminology: unicasting, multicasting, broadcasting, broadband, point-to-point, multipoint.

Module-II: **(6)**

Overview of OSI & TCP/IP model, Physical & Data link layer:

Overview of OSI & TCP/IP model; Physical Layer: role of physical layer, switching.

Transmission modes: Simplex, Half duplex, full duplex; Data Link Layer: Data link layer design issues, Error detection and correction, elementary data link layer protocols, sliding window protocol; media access control sub-layer.

Module III: **(6)**

Network layer:

Network Layer Design issues, overview of Routing Algorithms, overview of Congestion Control Algorithms, Internetworking, role of the Network Layer in the Internet.

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Module IV: **(6)**

Transport and Application layer: Elements of Transport Protocols, Simple Transport Protocol, UDP & TCP protocol. Application Layer: DNS—The Domain Name System, Electronic Mail, The World Wide Web, Multimedia.

Module V: **(6)**

Network Security: Cryptography, Symmetric-Key Algorithms, Public-Key Algorithms, Digital Signatures, Management of Public Keys, Communication Security, Authentication Protocols, E-Mail Security, Web Security, Social issues.

Text and Reference Book:

1. Andrew S. Tanenbaum, "Computer Networks", 4e, PHI
2. B.A. Forouzan, "Data Communication and Networking". 4e, TMH
3. Stallings. W., "Data and Computer Communication", 6e, PHI.

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Diploma in Electronics & Communications Engineering (Semester-VI)

DEC 6014 INDUSTRIAL INSTRUMENTATION LAB.

Course Objective: Student will be able to:

1. Measure displacement and weight using LVDT and Strain gauge respectively.
2. Identify and recognize the photosensors.
3. Understand and obtain the characteristics of the temperature transducers like RTD and Thermistor.
4. Understand the concept of Thermocouples and identify hysteresis and linearity by calibration of Thermometer.
5. Understand accelerometer for measurement of vibrations and concepts of ladder programming.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Identify and apply LVDT and strain gauge for displacement and weight measurements.
CO2 Appreciate and comprehend the applications of photosensors.
CO3 Understand and apply the temperature transducers like RTD and Thermistor.
CO4 Calibrate and identify the characteristics of Thermocouple and Thermometers. .
CO5 Understand and apply vibration sensors and identify the concepts of ladder programming.

List of experiments:

MODULE 1: **(4)**

1. Measurement of displacement using LVDT
2. Measurement of weight using Strain gauge trainer

MODULE 2: **(4)**

3. To determine characteristics of PIN Photodiode
4. To determine characteristics of Phototransistor

MODULE 3: **(4)**

5. To determine characteristics of Platinum RTD
6. To determine characteristics of NTC Thermistor

MODULE 4: **(4)**

7. To determine characteristics of K type Thermocouple
8. To calibrate a Thermometer.

MODULE 5: **(4)**

9. To measure vibrations using accelerometer.
10. Introduction to ladder programming & to implement basic logic gates

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Diploma in Electronics & Communications Engineering (Semester-VI)

DCS 6004 COMPUTER HARDWARE LAB.

Course Objectives:

1. To enable students to understand the layouts and components on different motherboard form factors (XT, AT, LPX, ATX).
2. To train students on disassembling and assembling PCs of various form factors (XT, AT, ATX) taking care of the compatibility of various components.
3. To familiarize students with BIOS setup and operating system installation procedures.
4. To familiarize students with disk management techniques, such as partitioning, formatting, and creating volumes.
5. To train students to perform maintenance procedures, like system restore, disk defragmentation, and scanning with anti-virus.

Course Outcomes:

After completing this course students should be able to:

1. Identifying and differente various motherboard form factors (XT, AT, LPX, ATX) and their key components.
2. Disassemble and assemble PCs of different form factors (XT, AT, ATX), understanding the hardware configuration.
3. Configure BIOS settings and install the Windows operating system, and manage system configurations.
4. Use disk management techniques to create and manipulate partitions, volumes, and dynamic disks, ensuring efficient data storage and organization.
5. Perform maintenance tasks like system restore, disk defragmentation, and virus scanning.

List of Experiments

1. Study of motherboard:
    a. XT form factor.
    b. AT form factor.
    c. LPX form factor.
    d. ATX form factor.
2. Disassembling of PC:
    a. PC- XT
    b. PC- AT
    c. PC- ATX
3. Assembling of PC:
    a. PC-XT
    b. PC-AT
    c. PC-ATX
4. Study of BIOS Setup.
5. Installation of Windows-XP operating system.
6. Repairing corrupted operating system.
7. Installation of display diver, sound driver, network driver.
8. Managing disk and file system:
    a. Installing two hard disk
    b. Creating primary, extended, logical partition
    c. Formatting a partition
    d. Converting a Basic Disk to a Dynamic Disk

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e. Understanding simple, spanned, striped, Mirrored volume
    i. Creating Simple volume
    ii. Creating spanned volume
    iii. Creating striped volume
    iv. Extending volume size
    v. Deleting simple, striped, spanned volume

9. Preventive maintenance tools**:**
    a. System restore
        i. Creating restore point
        ii. Restore system to earlier date and time.
    b. Disk defragmentation
    c. Scandisk
    d. Installation and configuration of Anti-virus
10. Installation and configuration of VM Ware.

Text book:

3. Ron Gilster, "PC Hardware: A Beginner's Guide", TMH
4. C.A.Schmidt, "The Complete Computer Repair Textbook", 3e, Dreamtech

Reference book:

2. David Groth, "A+ Complete Study Guide", 3e

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Diploma in Electronics & Communications Engineering (Semester-VI)

DCS 6008 COMPUTER NETWORKING & SECURITY LAB.

COURSE OBJECTIVES:

1. To enable them to understand the functionality of various network devices and configure IP address for a small network.
2. To enable them to make the required settings for file and device sharing within a network and access shared resources.
3. To teach them how to configure and manage network security settings and how to implement security policies.
4. To teach them how to install server operating system and to enable them to set up a client-server network.
5. To teach them how to configure and manage terminal client services, and manage user accounts.

COURSE OUTCOMES:

After completing this course students should be able to:

1. Understand the functionality of various network devices and configure IP address for a small network.
2. Make the required settings for file and device sharing within a network and enable accessing of shared resources.
3. Configure and manage network security settings and implement security policies.
4. Install server operating system and set up a client-server network.
5. configure and manage terminal client services, and create as well as manage user accounts.

List of Experiments

1. Identification of various network components/devices e.g. Connectors, Hub, Switch, Modem
2. Preparation of cross and parallel cable.
3. Setting IP address.
4. Using command line diagnostics: ipconfig and ping.
5. Setting-up of small home/office network:
    a. Connecting PCs in a network.
    b. Configuring PCs in a network.
    c. Creating workgroup.
6. File and print sharing
    a. Setting-up file sharing options (read/write/full control).
    b. Setting-up print sharing options.
    c. Installation of network printer.
7. Configuring and managing computer security
    a. Account lockout
    b. Password policy
    c. Audit policy
    d. User Rights Assignment
    e. Security Options
8. Setting-up of Remote desktop services
9. Netmeeting:
    a. Installation of Netmeeting
    b. Sharing of files on Netmeeting

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   c. Desktop sharing
   d. Shared white board
10. Setting-up remote assistance.
11. Installation of server Operating system.
12. Installation of Active directory.
13. Configuring access permissions.
14. Installation & configuration of TCS(Terminal Client Services)
15. Quota Management
16. Managing user accounts
    a. Creating user accounts
    b. Making a user account member of Administrative group.
    c. Assigning permissions

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Diploma in Electronics & Communications Engineering (Semester-VI)

DEC6011 WIRELESS AND MOBILE COMMUNICATION (ELECTIVE – I)

Course Objectives:

This course enables the students to:

1 Compare operation of different mobile communication system.
2 Describe cellular concept such as frequency reuse, hand off; coverage & capacity.
3 Draw GSM system architecture and Explain call processing in GSM.
4 Explain CDMA (IS-95) standards and Explain Call processing in CDMA.
5 Study the modern wireless communication schemes.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Understand the different mobile systems.
CO2 Understand cellular concept such as frequency reuse, hand off; coverage & capacity.
CO3 Demonstrate GSM system architecture and call processing in GSM.
CO4 Demonstrate CDMA (IS-95) standards and Call processing in CDMA.
CO5 Understand the modern wireless communication schemes and their applications.

Module-I: **[6]**

Introduction to wireless communication system: Evolution of mobile radio communication, Mobile radio system around the world, Related definition, base station, control channel, forward channel etc, Examples of wireless communication system such as paging system, cordless telephone system, cellular telephone system, how cellular telephone call is made.

Module-II: **[6]**

Mobile unit: Block Diagram and operation of mobile unit, Block Diagram & Explanation of frequency synthesizer, Block diagram and operation of transmitter, receiver, logic unit, control unit & handset.

Module-III: **[8]**

The cellular concept: Introduction to cellular concept, Introduction to basic cellular system, Frequency reuse, Hand off, Type of hand off, Interference & system capacity, Co channel interference & system capacity, Channel planning for wireless system, Adjacent channel Interference, Improving coverage and capacity in cellular system, Cell splitting, Sectoring, Repeater for range extension, Micro cell zone concept.

Module-IV: **[5]**

Digital cellular mobile systems: G.S.M system architecture, G.S.M services & features, G.S.M radio subsystems, G.S.M channel types, Message & call processing in GSM, Privacy & security in GSM, Signal system no.7 (ss7)—performance services, CDMA digital cellular standard IS-95, IS.95 frequency & channel specification, IS.95 channel structure, Forward & Reverse channel modulation process, IS-95 system architecture.

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Module-V: **[5]**

Modern wireless communication system: 3GW-CDMA (UMTS) (Universal mobile Telecommunication system.), 3G CDMA 2000, 3G- TD-SCDMA (synchronous), Wireless local loop & LMDS (local multipoint distribution), IMT 2000.

Text books:

1. Wireless Communication: Principles & Practice by T.S. Rappaport, Pearson Education
2. Mobile Cellular Telecommunication by William Lee, Tata McGraw Hill

Reference books:

1. Mobile & Personal Communication Services & System by Raj Pandya, Prentice Hall of India.

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Diploma in Electronics & Communications Engineering (Semester-VI)

DEC6013 TELEMATICS (ELECTIVE – I)

OBJECTIVE: Student will be able to:

1. Identify different sections of telephone receiver and different tones used in telephone exchange.
2. Explain different digital switching system and analog and digital services.
3. Explain different analog and digital services.
4. Explain Principle and services provided by ISDN.
5. Install EPABX system and explain the operation.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Understand the basics of telephone systems.
CO2 Understand and identify switching systems.
CO3 Demonstrate different analog and digital services.
CO4 Demonstrate principle and services provided by ISDN.
CO5 Understand the principle and applications of EPABX.

Module-I: **[5]**

Telephone Instrument and signals: Introduction, Telephone receiver, Block diagram & operation of electronic telephone, Tones used in telephone exchange dial tones, busy tone, ring tone, number unobtainable tone, Touch tone (DTMF), Block diagram of cordless telephone system, Frequency allocation.

Module-II: **[6]**

Digital Switching System: Introduction, Classification of switching system, Telecommunication network – trunks, subscriber lines, Basic of switching system.- Inlets, outlets symmetric network, folded network, blocking network, non-blocking network, Elements of Switching system, SPC (Stored program control),Centralize SPC, Distributed SPC, Enhanced services, Telephone Network, Subscribers loop system – MDF,MF, FP, BF,DP,DC,DW, Switching Hierarchy routing, Numbering plan- Telephone number.

Module-III: **[7]**

Analog, Digital Services and Applications of Telecommunication.(only informative treatment): Analog services – Switched, leased, local call service, Toll call services, 800 services, WATs, 900 services, Digital services- switched / 56, Digital data service (DDS), Digital signal services (DS), Digital subscriber line (DSL) – ADSL, Business applications of telecommunication, Automated teller machines(ATM), Videoconferencing, Banking, Shopping, Telecommuting, Distance Learning, Telemedicine.

Module-IV: **[5]**

ISDN: Motivation for ISDN, Services provide by ISDN, X. 400 family of standards, Architecture of ISDN, ISDN rate access interface, Primary rate access (PRI) interface, Basic rate access (BRI) interface, Message format for ISDN, ISDN address structure, Broad band ISDN, Introduction to FAX, Working principle of FAX, Image processing, Data compression, Block diagram & operation of FAX machine, Introduction to Modem, Working principle of Modem, Types of Modem- Synchronous, Asynchronous, half duplex & full duplex, Block schematic of Modem, ADSL & cable Modem.

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Module-V: **[7]**

Telephone Instrument (DTMF): Tone Type, MF, Wireless Telephone, ISDN Installation, ISDN Procedure, ISDN telephone, Conferencing, Internet

EPABX (Electronic private automatic business exchange): Block diagram, Signal Processing, Analog CMOS cross point switch, Digital TDM / PCM switch, Installation procedure for EPABX, Programming on Console, on terminal, on computer, Maintenance technique, Voice Over IP Phone, Wiring Diagram.

Text and Reference books:

1. Telecommunication switching systems and networks by T. Vishwanathan, Prentice Hall of India.
2. Principle of Telephony by N.N Biswas, Radiant Books
3. Management of Telecommunication by H. Carr and C. Snyder, Tata McGraw-Hill.

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Diploma in Electronics & Communications Engineering (Semester-VI)

DME6015 MECHATRONICS (ELECTIVE – I)

OBJECTIVE: Student will be able to:

1. Identify various mechatronic elements.
2. Interpret the operations of microprocessors, microcontrollers, PID controllers and PLCs.
3. Understand the operations drives and mechanisms of automated systems.
4. Understand the concept of hydraulic Systems.
5. Understand the concept of Pneumatic Systems.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Understand the basics of mechatronic elements.
CO2 Demonstrate PLC programs with ladder diagrams identify the microprocessors, microcontrollers, PID controllers and PLCs.
CO3 Identify and demonstrate the drives and mechanisms of automated systems.
CO4 Demonstrate principle and applications of Hydraulic Systems.
CO5 Understand the principle and applications of Pneumatic Systems.

Module-I: **[7]**

Introduction and Mechatronics elements: Definition of mechatronics. Mechatronics in manufacturing, products and design. Review of fundamentals of electronics. Introduction to Sensors, Transducers and Actuators Principle, working and applications of-Limit switches, proximity switches like inductive ,capacitive and optical (deflecting and through beam type) , Thumb wheel Switches magnetic reed switches , Optical encoders-displacement measurement, rotary, incremental, opto-couplers. Actuator – solenoids – on-off applications, latching, triggering.

Module-II: **[5]**

Processors /controllers: Microprocessors, microcontrollers, PID controllers and PLCs.

Module-III: **[6]**

Drives and mechanisms of an automated system: Drives: stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, and transfer systems.

Module-IV: **[6]**

Hydraulic system: Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, pumps. Design of hydraulic circuits.

Module-V: **[6]**

Pneumatic system: Pneumatics: production, distribution and conditioning of compressed air, system components and graphic representations, design of systems.

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Text Books:

1. Bolton W. Mechatronics- Electronic control systems in Mechanical and Electrical Engineering. Pearson Education Ltd.
2. Histand B.H. and Alciatore D.G .Introduction to Mechatronics and Measurement systems; Tata McGraw Hill Publishing

Reference Books:

1. John W. Webb and Ronald Reis Programmable Logic Controllers; Prentice Hall of India.
2. NIIT Programmable Logic Control – Principles and Applications; Prentice Hall of India
3. Kholk R.A. and Shetty D.Mechatronics systems design Vikas Publishing, New Delhi
4. Mahalik N.P. Mechatronics principles, concepts and applications; Tata McGraw Hill Publishing

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Diploma in Electronics & Communications Engineering (Semester-VI)

DEC 6015 VLSI DESIGN (ELECTIVE – I)

OBJECTIVE: Student will be able to:

1. Understand fundamental issues of VLSI technology and to appreciate the limitations imposed by the processing technology on the VLSI circuit designer.
2. Appreciate how the VLSI objectives are drawn together in CMOS subsystems design.
3. Understand system architectures and their internal make and design.
4. Understand system design strategies and their implementation via automated techniques and high-level design language.
5. Understand the principles of design verification and testing.

Course Outcomes:

After completion of the course, the students will be able to:

CO1	Understand the basics of VLSI technology.
CO2	Demonstrate CMOS subsystems design.
CO3	Identify and demonstrate the finite state machines and architecture of ASIC & PLDs.
CO4	Implement design strategies via automated techniques and high-level design language.
CO5	Apply the principles of design verification for operations and testing.

Module-I: **[8]**

VLSI concept and technology: Very Large Scale Integration (VLSI) Technology - Classification of IC Technology, MOSFETs current equation in Linear & Saturation Mode, Threshold voltage-Definition, Derivation of Threshold voltage(Numerical), Body effect & effect of body effect on Threshold voltage, Short channel effect; VLSI Concepts- Resistance & capacitance estimation of MOSFET, C-V (capacitance-voltage) characteristics of MOS capacitor, Principle of MOS scaling, types of scaling, functional limitation of scaling, Wafer Processing with C-Z method, Definition & Application of Mask generation, Oxidation, Diffusion, Ion Implantation, Metallization, Photolithography in MOSFET, Basic process steps of n-MOS, Basic process steps of CMOS, Latch up in CMOS and its prevention.

Module-II: **[5]**

MOS Inverters: Aspect ratio and Inverter ratio, n-MOS inverter with resistive load, n-MOS inverter with EMD load, n-MOS inverter with DMD load, CMOS inverter, Logic Gates using n-MOS & CMOS (Only circuit diagram &operation), Realization of any Boolean equation using n-MOS & CMOS.

Module-III: **[6]**

Finite state machines (FSM): Moore and Mealy machines: Implementation of circuits using Moore and Mealy machines.

Architecture of ASIC and PLD: CPLD -Xilinx and Atmel series architecture, Details of internal block diagram, Introduction to FPGA like Xilinx (FPGA), SPARTAN 3 series and Atmel.

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Module-IV: **[6]**

Hardware Description Language (HDL): Features of Verilog-Entity, Architecture, Configuration, Package, Bus, Driver, Attributes, Process, Behavioral Modeling, Sequential Processing, Data Types.

Simulation, Testing and Synthesis using VHDL: Simulation Issues, Testing Issues, Synthesis Issues Configurations.

Module-V: **[5]**

Hardware Modeling examples (operation & block Testing): Different styles of modeling, Modeling simple elements, Modeling conditional operators, Modeling combinational logic, Modeling regular structure, Modeling synchronous logic

Text books:

1. Introduction To VlSI Design by Eugene D. Fabricius, Mcgraw-Hill
2. Principals Of Cmos Vlsi Design by Neil H. E. WesteKamran, Pearson Education

Reference books:

1. Basic VlSI Design by Douglas A. Pucknell, Kamran, Prentice Hall Of India
2. Xilinx Manual, Xilinx, www.Xilinx.Com.

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Diploma in Electronics & Communications Engineering (Semester-VI)

DEC6017 MEDICAL ELECTRONICS (ELECTIVE – II)

OBJECTIVE: Student will be able to:

1. Understand the principles of basic sciences and mathematics for engineering solutions.
2. Identify and understand the signals from physiological parameters and the transducers as a control element.
3. Study standard biomedical recorders for medical diagnostic & therapeutic problems.
4. Understand the principles of modern technology tools necessary for the patient monitoring systems.
5. Understand the principles of safety precautions of biomedical equipment for proper operations and maintenance.

Course Outcomes:

After completion of the course, the students will be able to:

CO1 Apply the principles of basic sciences and mathematics for engineering solutions.
CO2 Demonstrate transducers as a control element for measurement of the signals from physiological parameters.
CO3 Find solutions to medical diagnostic & therapeutic problems using biomedical recorders.
CO4 Use modern technology tools necessary for the patient monitoring systems.
CO5 Handle, service and maintain the biomedical equipment.

Module-I: **[6]**

Introduction to Anatomy and Physiology - Elementary ideas of cell structure; Heart and circulatory system; Central nervous system; Muscle action; Respiratory system; Body temperature and reproduction system.

Overview of Medical Electronics Equipment- classification, application and specifications of diagnostic, therapeutic and clinical laboratory equipment, method of operation of these instruments.

Module-II: **[6]**

Electrodes- Bioelectric signals, Bio electrodes, Electrode, Electrode tissue interface, contact impedance, Types of Electrodes, Electrodes used for ECG, EEG

Transducers-Typical signals from physiological parameters, pressure transducer, flow transducer, temperature transducer, pulse sensor, respiration sensor.

Module-III: **[6]**

Bio Medical Recorders- Block diagram, description and application of following instruments:

1. ECG Machine 2. EEG Machine 3. EMG Machine

Module-IV: **[6]**

Patient Monitoring Systems- Heart rate measurement; Pulse rate measurement; Respiration rate measurement - a. Blood pressure measurement b. Principle of defibrillator and pace maker.

w.e.f. 2018

Module-V: **[6]**

Safety Aspects of Medical Instruments- Gross current shock; Micro current shock; Special design from safety considerations; Safety standards.

Text books:

1. Handbook of biomedical Instrumentation by RS Khandpur
2. Biomedical Instrumentation by Cromwell,

Reference books:

1. Modern Electronics Equipment by RS Khandpur, TMH, New Delhi
2. Introduction to Biomedical Electronics by Edward J. Perkstein; Howard Bj, USA

w.e.f.2018

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Diploma in Electronics & Communications Engineering (Semester-VI)

DEC6013 OPTICAL FIBER COMMUNICATION (ELECTIVE – II)

OBJECTIVE: Student will be able to:

1. Discuss the importance of various types of optical communication.
2. Understand the principle of the light propagation in optical fibers.
3. Understand the causes of attenuation and dispersion in fibers.
4. Understand the transmission characteristics of optical fibers and the principle of LED and LD.
5. Describe the operation and circuit of photo detectors and optical receivers.

Course Outcomes:

After completion of the course, the students will be able to:

CO1	Apply the principles of various types of optical communication.
CO2	Illustrate the principles of propagation of light through optical fibers.
CO3	Find solutions to causes of attenuation and dispersion in fibers.
CO4	Use the existing technology and tools necessary for optical transmitters.
CO5	Demonstrate optical receivers, repeaters and applications of optical communications.

Module-I: **[6]**

Introduction: Different Optical Communication System, Analog Vs Digital Communication, Need for Optical Communication, Basic Elements of an Optical Communication.

Module-II: **[6]**

Optical Fiber: Basic Principle involved, Fiber Classification, Acceptance angle, Acceptance Cone, Numerical Aperture, Ray optics representation, Advantages and disadvantages of using optical fiber as communication medium.

Module-III: **[6]**

Losses and Dispersion in Optical Fiber: Attenuation and its units, simple numerical, Fiber Losses (Material, Scattering, Splice, Absorption, Radiative). Dispersion (Modal, Material, Wave guide).

Module-IV: **[6]**

Optical Transmitter: Fiber Optic communication system, Transmitter, Different elements of optical transmitter, Light source, its important parameters, Drive Circuit.

Optical Sources: LED, LED structure, light source materials, efficiency and modulation of LED. Laser Diode, structure, radiation pattern, efficiency & modulation of laser diode.

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Module-V: **[6]**

Optical Receiver: Different elements of optical Receiver, Optical detector and its operating parameters, Demodulation Techniques. Optical Repeaters.

Application: Various applications & future developments of optical communication system.

Text books:

1. Optical Fiber Communication – By – G. Keiser
2. Optical Fiber and Laser – By – Anuradha De

Reference books:

1. Introduction to Fiber Optics – By – Ghatak and Thyagarajan
2. Optical Fiber Communication – By – J. M. Senior

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Diploma in Electronics & Communications Engineering (Semester-VI)

DCS 6017 INTERNET OF THINGS (ELECTIVE – II)

Course Objective:

1. To understand basics of Internet of Things.
2. To understand various wireless communication techniques.
3. Understanding use of various protocols.
4. Understanding of various embedded components & physical design.
5. Students will be able to create and implement APIs.

Course Outcomes:

After completing this course students should be able to:

1. Understand the fundamental concepts and principles of the Internet of Things (IoT).
2. Compare various wireless communication standards used in IoT.
3. Understand the principles of internet and communication protocols relevant to IoT.
4. Understand the components and technologies involved in embedded devices (sensors, actuators, microcontrollers, etc.) used in IoT systems.
5. Understand the role of online components are used in of IoT systems, process of implementation and testing of APIs for IoT applications.

Module-I: **[6]**

The Internet of Things: An Overview:

M2M and Internet of Things Technology Fundamentals, IoT Architectural, design principles and needed capabilities, standards considerations.

Module-II: **[6]**

Wireless Communication standards:

Bluetooth, wifi, PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7.

Module-III: **[6]**

Internet Principles:

Internet Communications: IP , TCP, Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, HTTP Ports, Other Common Ports, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.

Module-IV: **[6]**

Embedded Devices:

Electronics: Sensors, Actuators, Scaling up the Electronics, Embedded Computing Basics, Microcontrollers.

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Module-V: **[6]**

Online Components:

Getting started with an API, Legalities, Writing a new API, security, implementing the API & testing.

Text book:

1. McEwen, Adrian, and Hakim, Cassimally, "Designing the Internet of Things", John Wiley & Sons, Incorporated, 2013.

Reference book:

1. Arsheep Bahga & Vijay Madisetti, "Internet of Things: A Hands-On Approach", Paperback – 2015.

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