## Diploma in Electronics and Instrumentation Engineering

| SUBJECT CODE | Category | SUBJECT NAME | TEACHING & EVALUATION SCHEME | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | THEORY | | | PRACTICAL | | Th | T | P | CREDITS |
| | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* | | | | |
| DTCH 101 | | Applied Chemistry | 60 | 20 | 20 | 30 | 20 | 2 | 1 | 2 | 4 |

**Legends**: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

**Course Education Objectives:-**
To give basic knowledge of polymer science.
To understand and apply the knowledge of electro-chemistry and its laws.
To give basic knowledge of corrosion and control over it.
To understand the various sophisticated instrumental techniques.
To give basic knowledge of water, lubricants and different properties of water.

**Course Outcomes:-**
After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The student will demonstrate capability of
CO1. Theoretical understanding of various high polymers and their properties.
CO2. Became aware of the importance of electro-chemistry and its laws in the field of technology and dealing with its numerical approach.
CO3. Understanding metal corrosion and control over it.
CO4. Implementing instrumental techniques as powerful tool for qualitative and quantitative analysis of compounds.
CO5. Analyzing boiler feed water for industrial use and drinking water for domestic use.

**Syllabus**

**Unit-I**
**POLYMERS AND REINFORCED PLASTICS**
Classification of polymers - types of polymerization reactions - mechanism of addition polymerization: free radical, ionic and Ziegler - Natta - effect of structure on the properties of polymers - strength, plastic deformation, elasticity and crystallinity -Preparation and properties of important resins: Polyethylene, PVC, PMMA, Polyester, Teflon, Bakelite and Epoxy resins.

**Unit-II**
**(A) Electrochemistry**:
Arrhenius theory of electrolytic dissociation, Transport number, Kohlrausch's law, Solubility product, Redox reaction, Electrochemical and concentration cells.
**(B) CORROSION AND ITS CONTROL**
Corrosion: Basic concepts - mechanism of chemical, electrochemical corrosion - Pilling Bedworth rule – Types of Electrochemical corrosion - galvanic corrosion - differential aeration corrosion - pitting corrosion - stress corrosion – Measurement of corrosion (wt. loss method only) - factors influencing

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corrosion. Corrosion control: Cathodic protection - sacrificial anodic method – corrosion inhibitors, Protective coating.

**Unit-III**

Basic Instrumental Techniques

Basic principles, instrumentation and applications of potentiometry, UV - visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy and flame photometry.

**Unit-IV**

**(A)WATER TREATMENT**

Water quality parameters: Physical, Chemical & Biological significance - Hardness of water - estimation of hardness (EDTA method) - Dissolved oxygen – determination (Winkler's method), Alkalinity - determination - disadvantages of using hard water in boilers: Scale, sludge formation - disadvantages - prevention - treatment: Internal conditioning - phosphate, carbon and carbonate conditioning methods - External: Zeolite, ion exchange,Lime Soda methods & Numericals- desalination - reverse osmosis and electrodialysis - domestic water treatment.

**(B) Lubricants:**

Mechanism of lubrication, Classification of lubricants, Properties & testing of lubricating oil. Definition of viscosity of a liquid; Determination of Viscosity; Shear Viscosity; Intrinsic Viscosity; Molecular weight from Viscosity measurement & Numerical problems based on viscosity index.

**Unit-V**

**Metal in Industry**

Structure of coordination compounds corresponding to coordination number up to 6, Types of ligands, Isomerism [geometrical, optical, ionization, linkage and coordination], Theories of bonding in coordination compounds- crystal field theory, Valence bond theory, Chelation.

**References**

1. *Applied Chemistry – Theory and Practice, O.P. Viramani, A.K. Narula, New Age Pub.*
2. *Polymer Science – Ghosh, Tata McGraw Hill.*
3. *Chemistry for Environmental Engineering – Sawyer, McCarty and Parkin – McGraw Hill, International.*
4. *Basic Lubrication theory – Alistair Cameron*
5. *Engineering chemistry- Dr. Jyoti Mitna*
6. *Engineering chemistry- Dr. Sunita Ratan*
7. *Applied Chemistry – S.M. Khopkar*
8. *Polymer Science- V.R. Gowawriker*
9. *Introduction of polymer science- G.S. Mishra*

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| DTMA 201 | | Applied Mathematics-2 | 60 | 20 | 20 | 0 | 0 | 3 | 1 | 0 | 4 |

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**Course Eduction Objectives(CEO's):-**
To introduce the students with the Fundamentals of the Advanced Engineering Mathematics.

**Course Outcomes:-**
After the successful completion of this course

1. students will be able to apply the techniques of finding limit, continuity and differentiability of any function with conclusions.
2. understand the applications of the matrices and the determinants.
3. know the fundamentals of the partial derivatives and the 3D geometry.
4. study the properties of the integral calculus used in the field of the engineering.
5. understand the concepts and the solution of the differential equations.

**SYLLABUS**

**Unit-I**

**FUNCTION, LIMIT, CONTINUITY & DIFFERENTIABILITY**: Function, Definitions of variables, constants, open & closed intervals. Definition & types of functions – Simple Examples, Limits, Concept & definition of Limit. Standard limits of algebraic, trigonometric, exponential and logarithmic functions. Evaluation of limits. Continuity, Definition and simple problems of continuity. DERIVATIVE: Definition of Derivatives, notations. Derivative of standard functions. Rules for differentiation in case of sum, difference, product and quotient of functions. Derivative of composite functions (Chain rule). Derivatives of inverse trigonometric functions. Derivatives of implicit functions. Logarithmic derivatives. Derivatives of parametric functions. Derivative of one function with respect to another function, Second order derivatives. Applications of Derivatives. Geometric meaning of derivative. Rate measurement, Maxima & Minima (one variable)

**Unit-II**

**MATRICES & DETERMINATS**: Define matrix and its representation state its order. State types of matrices with examples. Perform Addition, subtraction and multiplication of a matrix with a scalar and multiplication of two matrices (upto third order only). Transpose, Adjoint and Inverse of a matrix upto third order. Solution of simultaneous equations by matrix method (linear equations in two and three unknowns). Problems on above, DETERMINATS: Define determinant (second and third order). Minor,

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CO-factor, Study properties of determinatants. Cramer's Rule: (solutions of simultaneous equations of two and three unknown).

**Unit-III**

**PARTIAL DIFFERENTIATION & ANALYTICAL GEOMETRY IN THREE DIMENSIONS**: Functions of several variables. Partial derivatives up to three independent variables, Maxima & Minima, Euler's Theorem on homogenous function for two variables. ANALYTICAL GEOMETRY IN THREE DIMENSIONS: Co-ordinates of a point in rectangular co-ordinate system, Distance formula, Division formula, Dcs & Drs of a line, the formula for angle between two lines with given Drs, conditions of perpendicularity and parallelism. State equation of a plane, Find equation of a plane in different forms (i) General form Ax+By+Cz+D=0, where A,B,C are Drs of the normal to the plane, (ii) Intercept form (X/a+Y/b+Z/c=1), (iii) Normal form, Angle between two planes, Perpendicular distance from a point to a plane.

**Unit-IV**

**INTEGRAL CALCULUS**: Integration as inverse process of differentiation. Indefinite and Definite Integral, Integrals of standard functions, Methods of Integration (i) Integration by Decomposition of Integrand, (ii) Integration by Substitution, (iii) Integration by parts, Methods of Integration by partial fraction. Definite Integrals, Properties of Definite Integrals. Area bounded by the curve y=f(x), x=a, x= b and x -axis and the area bounded by the curve x=f(y), y=c, y= d and y - axis.

**Unit-V**

**DIFFERENTIAL EQUATION**: Differential equation, Order and degree of a differential equation, Formation of first order first degree differential equation. Solution of first order and first degree differential equation by the following methods (i) separation of variables (ii) Linear (iii) Exact

**Text Books:**

1. *A. Sarkar, Mathematics (First Semester), Naba Prakashani*
2. *G.P. Samanta, A Text Book of Diploma Engineering Mathematics, Volume-1, Learning Press*
3. *Dr. S. Bose & S. Saha, A Complete Text Book of Mathematics, Lakhsmi Prakasan*

**Reference Books:**

1. *H.S. Hall & S.R. Knight, Higher Algebra Book Palace, New Delhi*
2. *S.L. Loney, Trigonometry S. Chand & Co.*
3. *H.K. Dass Engineering Mathematics S. Chand & Co.*
4. *T.M. Apostol Calculus, Volume-1, John Wiley & Sons*
5. *B.K.Pal, K.Das, Engineering Mathematics, Volume-1, U.N. Dhar & Sons*
6. *B.C. Das & B.N. Mukherjee, Differential Calculus U.N. Dhar & Sons*
7. *KAR, Engineering Mathematics, Tata McGraw- Hill*
8. *SINGH, Engineering Mathematics Tata McGraw- Hill*

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| DTEI 101 | | Introduction to Electronics and Instrumentation | 60 | 20 | 20 | 30 | 20 | 3 | 1 | 2 | 5 |

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***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

**Course Eduction Objective:**

Student should familiar with all Aspects of Electronics & Instrumentation and various measuring and sensing instruments by Identification and working point of view with good understanding as well.

**Course Outcomes:**

1. Student will be able to design and testing of Electronic Circuits based on sensors on Breadboard and PCB as well.
2. Student will be able to Understand various types of errors & detecting techniques..
3. Student will be able to know the working of Electronic Bridges to measure Electronic Parameters..
4. Student will be able to explain about the working of Display Devices like LCD,LED & Seven Segment Display .

**Syllabus**

**Unit-I**

Fundamentals Concepts & Identification of Electrical & Electronics Components, their values determination and Testing with CRO, Multimeter etc. Circuit designing on Breadboard, PCB, Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, multimeter probes Digital voltmeter systems, digital multimeters, digital frequency meter system.

**Unit-II**

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter.

**Unit-III**

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CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO, its applications ,LED,LCD & seven segment Display.

**Unit-IV**

Instrument calibration: Comparison method, digital Multimeter as standard instrument, calibration instrument Recorders: X-Y recorders, plotters.

**Unit-V**

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter

**References:**

1. *Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.*
2. *Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann), 2008.*
3. *A.K. Sawhney; A Course in Electrical and Electronic Measurements Dhanpat Rai Publication.*
4. *Robert Boylestad & Nashetsky; Electronics Devices and Circuits Theory;Pearson Ed.*
4. *Salivahanan,Vallabhraj; Electronics Devices and Circuits ;McGraw Hill Publication.*

**List of Experiments:**

1. Identification of Electronics Components and determination of their values by Color, Digits & Terminals/Pins Coding.
2. Study of Function Generator, Waveforms, CRO, Multimeter and other measuring and Testing Equipments.
3. Practice of Circuits/Components Assembling on Breadboard and their Testing.
4. PCB Designing with Layouts, Soldering, Drilling process.
5. Circuit / Components Testing by Multimeter, CRO and other methods.
6. To measure Various Electrical parameters by Various Electronic Bridges..
7. To study the PMMC instruments.
8. To study the MI Instruments.
9. To study the LED, LCD and Seven Segment Display.

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| | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* | | | | |
| DTEI 102 | | Fundamental of Electronics | 60 | 20 | 20 | 30 | 20 | 2 | 1 | 2 | 4 |

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**Course Eduction Objectives (CEO's):-**
The subject aims to provide the student with:

- An understanding of basic Electronics Engg. abstractions on which analysis and design of electronic circuits and systems are based, basic devices( analog and digital) and instrumentation abstractions.
- The capability to use abstractions to analyze and design simple electronic circuits.
- The ability to formulate and solve the different logic circuits and Boolean equations.
- An understanding of how devices such as semiconductor diodes, rectifiers, and bi-polar junction transistors are working and how they are used in the design of useful circuits.

**Course Outcomes:-**
1. Students will: Learn how to develop and employ circuit models for elementary electronic components, e.g., resistors, sources, inductors, capacitors, diodes and transistors;
2. Become adept at using various methods of circuit analysis, including simplified methods such as series-parallel reductions, voltage and current dividers, etc.
3. Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis;
4. Learn how the primitives of Boolean algebra are used to describe the processing of binary circuits and to use electronic components as building blocks in electronically implementing binary functions;

**Syllabus**

**UNIT-I**
Evolution and Impact of Electronics in industries and in society, Familiarization of Resistors, Capacitors, Inductors, Transformers and Electro mechanical components, PN Junction diode: Structure, Principle of operation, Photo diode, LED, Solar cell.

**UNIT-II**
Rectifiers and power supplies: Half wave and full wave rectifier, capacitor filter, Zener voltage regulator, Bipolar Junction Transistors: Structure, Principle of operation, characteristics Amplifiers.

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**UNIT-III**

Basic Instruments, electrical measurement – measurement of voltage , current , power & energy, voltmeters & ammeter , wattmeter , energy meter , , electronics instrument – multimeter, CRO(analog & digital),An overview of voltage regulator.

**UNIT-IV**

Number System: Introduction to binary, octal, decimal & hexadecimal systems, representation of negative numbers, 1's, 2's, 9's, 10's complement and their arithmetic. Introduction, Definitions, Principle of Duality, Basic Theorems, Applications of Boolean Algebra, Boolean Functions, Complement of Boolean Function. Logic Gates (Symbol, Truth Table, Logic Diagram): And, OR, NOT, NAND, NOR, XOR, XNOR. Universal Gates: NAND Gate and NOR Gate implementation.

**UNIT-V**

SIGNALS: Introduction, Representation of Discrete-time Signals: Graphical Representation, Functional Representation, Tabular Representation, Sequence Representation. Elementary Signals: Unit Step Function, Unit Ramp Function, Unit Parabolic Function, Unit Impulse Function, Sinusoidal Signal, Real Exponential Signal, Complex Exponential Signal, Rectangular Pulse Function, Triangular Pulse Function,

**References**

1. *Bell, D. A., Electronic Devices and Circuits, Oxford University Press*
2. *Boylested, R. L. and Nashelsky, L., Electronic Devices and Circuit Theory, Pearson Education*
3. *Digital Design M. Morris Mano and Michael D. Ciletti, Pearson Education*
4. *A Anand Kumar, Signals and Systems, PHI.*
5. *Vijay Baru, Rajendra Kaduskar, Sunil T. Gaikwad, Basics of Electronics Engineering, Wiley India Pvt. Ltd*

**List of experiments.**

1. Familiarization with Laboratory Instruments (Oscilloscope, Function Generator, Digital Multimeter, DC Power Supply)
2. Characterization of Passive Circuit Elements (R, L, C)
3. Time & Frequency Response of RC and RL Circuits
4. V-I curve for P-N Junction Diodes.
5. V-I curve for Zener Diode.
6. Zener as a voltage regulator
7. Half-Wave and Full-Wave( Center tapped and Bridge) Rectifiers
8. Bipolar Junction Transistor (BJT) Circuits (Inverter, Common Emitter Amplifier)
9. Conversion of number system
10. Basic Combinatorial Circuits

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| DTEI 103 | | Electronics workshop | 0 | 0 | 0 | 60 | 40 | 0 | 0 | 4 | 2 |

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**Course Objectives: -**

1. To provide basic introduction of electronic and electrical hardware systems.
2. To provide hands-on training with familiarization, identification, testing and assembling.

**Course Outcomes:-**

Students will be able to:

1. Learn and identify the active and passive electronic components.
2. Perform testing of electronic components
3. Analyze Inter-connection methods and perform soldering practice.
4. Use different software tools for PCB design.
5. Design of electronic circuits.

**List of Experiments:**

1. Familiarization/Identification of all active and passive electronic components with specification (Functionality, type, size, color coding, package, symbol, cost etc).
2. Familiarization/Identification of Electrical devices, Electronic devices, Electro-mechanical devices, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.).
3. Demonstration of various testing instruments such as multi-meter, Function generator, Power supply, CRO etc.
4. Demonstration of various commonly used tools Soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de-soldering station etc.

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5. Perform the testing of different electronic components (Resistor, Capacitor, Diode, Transistor) using Multi-meter and CRO and draw the characteristics of these electronic components.
6. Demonstration of Breadboard and design of basic circuits using Breadboard (Rectifier, Clippers, and Clampers etc.).
7. Introduction and Comparison of various types of PCBs.
8. Introduction and perform of PCB design techniques (itching, drilling, and soldering).
9. Design of Power Supply on general purpose PCB.
10. Develop clipper and clamper circuit on using PCB design techniques (itching, drilling, and soldering).

**Text Books:**

1. Electronic Devices, Thomas L. Floyd, Pearson (9th Edition), 9-Jan-2011.
2. Electronic Devices and Circuits, David A. Bell, Oxford Press (5th Edition) 30- April-2008.

**References:**

1 Printed Circuit Boards: Design, Fabrication, Assembly and Testing R.S. Khandpur Tata McGraw-Hill Education, 24-Feb-2005.
2 Printed Circuits Handbook Clyde Coombs McGraw Hill Professional, 22-May-2007.

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| DTCS 101 | | Computer Application-I | 0 | 0 | 0 | 30 | 20 | 0 | 0 | 4 | 2 |

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### Course Educational Objectives (CEOs):

1. To understand the concepts of programming languages (object oriented programming and its implementation).
2. To understand the concept of program design, program coding, debugging, testing for development.
3. To describe the concepts of loops, arrays.
4. To understand the concepts of memory, pointers, functions, variables.
5. To understand the concepts of class, constructor, destructor.

### Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Student will able to explain and implement the object oriented programming concepts.
2. Student will design, develop & test program for development.
3. Student will able to apply loop concept in program and design an array program.
4. Student will able to apply & implement the concept of class, constructor & destructor.

### Syllabus

**UNIT I**

Basic concepts of Computers, Basic LINUX Concepts and Vi – Editor, Internal and external DOS Commands, Shell programming. Basic concepts of MS-word, excel, PowerPoint and MS access Database.

**UNIT II**

Learning OS Commands Practice of all Internal and External DOS Commands, Writing simple batch programs, Exposure to Windows environment, Practice of UNIX commands and Vi editor, Writing simple shell script

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**UNIT III**

Introduction to C: Basic Programming concepts, Program structure in C, Variables and Constants, Data types, Conditional statements, control statements, Functions, Arrays, Structures, Introduction to pointers, and Introduction to File Systems.

**UNIT IV**

C Programming: Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input Output Formatting, Control structures, arrays, functions, structures, pointers and basic file handling.

**References**


1. *Kernighan, B.W.," The elements of programming style", McGraw-Hill.*
2. *Yourdon, E., "Techniques of program structures and design", Prentice-Hall. Press, W.H., Teukolsky, S.A., Vetterling W.T.& Flannery, B.P., "Numeri.*
3. *"Introduction to Computers" by Peter Norton.*
4. *Yashvant Kanethkar "Shell Programming".*


**List of Experiments**

1. Creation and editing of Text files using MS- word.
2. Creation and operating of spreadsheet using MS-Excel.
3. Creation and editing power-point slides using MS- power point
4. Creation and manipulation of database table using MS-Access.
5. Study and practice of Internal & External DOS commands.
6. Using basic DOS commands like date, time, dir, copy con, type, ren etc. Exercise
7. Creating the directory structure and Batch file in the DOS
8. Using Windows XP graphical user interfaces (GUI).
9. Using basic Linux commands
10. Study of Shell programming (Writing shell scripts using control structures )
11. Study and practice of Basic linux Commands – ls, cp, mv, rm, chmod, kill, ps etc
12. Using vi editor Shell Programming (Writing simple shell scripts, use of conditional structures).
13. Study and Practice of MS windows – Folder related operations, My-Computer, window explorer, Control Panel.
14. . WAP to illustrate constructor & Destructor
15. . WAP to illustrate Object and classes.
16. . WAP to illustrate Operator overloading
17. WAP to illustrate Function overloading
18. WAP to illustrate Derived classes & Inheritance

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