

Birla Institute of Technology, Mesra, Ranchi
(UNIVERSITY POLYTECHNIC)
Course Structure for Diploma in Engineering
Based on NEP-2020, CBCS and OBE, Effective from 2026-2027

MATHEMATICS-I

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DBS26101			COURSE TITLE: MATHEMATICS-I				
COMPULSORY / OPTIONAL: COMPULSORY							
TEACHING SCHEME AND CREDITS					EXAMINATION SCHEME		
L	T	P	HOURS/W EEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE: Provide basic knowledge of Mathematics for understanding the concepts of engineering and technology.

COURSE OUTCOMES

CO1	Students will be able to understand and apply the concepts of complex numbers, quadratic equations, permutations and combinations and binomial theorem to solve the mathematical problems related to engineering applications.
CO2	Students will be able to analyze and solve problems related to Cartesian coordinates, straight lines, and circles using the principles of two-dimensional coordinate geometry.
CO3	Students will be able to use trigonometric or Circular functions, identities, multiple and sub-multiple angle formulas for solving engineering problems.
CO4	The students will be able to understand and apply the Algebra of Vectors including vector product and cross product in engineering and allied sciences.
CO5	Students will be able to understand the concepts of limits and derivatives and apply differentiation techniques such as product rule, quotient rule, chain rule to polynomial and trigonometric functions.

COURSE CONTENT DETAILS:

MODULES WITH TOPICS
1. MODULE-I Trigonometry 1.1. Measurements of angles. Trigonometric or Circular functions. Formula and use of identities $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$, $\cot(A \pm B)$, $\cos\left(\frac{A \pm B}{2}\right)$, $\sin\left(\frac{A \pm B}{2}\right)$ 1.2. Trigonometric ratios of multiple angles and related identities. 1.3. Trigonometric ratios sub-multiple angles with related identities. <i>Course Outcome: CO3 Time: 10 hrs</i>
2. MODULE-II Basic Algebra 2.1. Definition and algebra of complex numbers, conjugate, modulus, and their properties. 2.2. Nature of roots of quadratic equations. Solution of quadratic equations with complex roots. 2.3. Definition of factorial notation, the formula of permutation and combinations. Binomial theorem for positive index. General terms and related problems. <i>Course Outcome: CO1 Time: 8 hrs</i>

3. MODULE-III Coordinate Geometry:

- 3.1. Cartesian Coordinates, Distance formulae, Section formulae, Midpoint.
 3.2. General equation of a straight line and its standard forms.
 3.3. Equation of circle, circle through three points, the circle with a given diameter.

Course Outcome: CO2 Time: 8 hrs

4. MODULE-IV Vector Algebra

- 4.1. Definition of Vector, Position Vector, Algebra of vectors (Equality, addition, subtraction, and scalar multiplication).
 4.2. Dot (Scalar) product with properties.
 4.3. Vector (Cross) product with properties.

Course Outcome: CO4 Time: 6 hrs

5. MODULE-V Elementary Calculus: Derivatives

- 5.1. The intuitive idea of functions and limits. Limits of polynomials and rational functions.
 5.2. The definition of derivative relates to the slope of the tangent of the curve, the derivative of the sum, difference, product, and quotient of a function (Formula only).
 5.3. Derivatives of polynomial and trigonometric functions.

Course Outcome: CO5 Time: 8 hrs

TEXT AND REFERENCE BOOKS

S. N.	Title	Author, Publisher, Edition, and Year of publication	ISBN
1.	Senior Secondary School Mathematics for Class 11	R. S. Agarwal, Bharati Bhavan Publishers & Distributors. 2020	ISBN-13 : 978-9350271476
2.	Senior Secondary School Mathematics for Class 12	R. S. Agarwal, Bharati Bhavan Publishers & Distributors. 2020	ISBN-13 : 978-9350271247
3.	ISC Mathematics Book 1 XI	O.P. Malhotra & S. K. Gupta & Anubhuti Gangal, 2020	ASIN: B0B2W2DXGM

E- REFERENCES:

1. [NCERT \(Mathematics for Class-XI\)](#)
2. [NCERT \(Mathematics for Class-XII Part-1\)](#)
3. [NCERT \(Mathematics for Class-XII Part-2\)](#)
4. [SWAYAM Lecture on Mathematics XI Part-I](#)
5. [SWAYAM Lecture on Mathematics XI Part-II](#)
6. [SWAYAM Lecture on Mathematics XII Part-I](#)

CO	PO						
	1	2	3	4	5	6	7
1	3	2	1	1	0	0	0
2	3	3	2	1	0	0	0
3	3	3	3	2	1	0	0
4	3	3	3	1	0	0	0
5	3	3	2	2	0	0	0

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PHYSICS-I

Programme: Diploma In Engineering							
Course Code: DBS26103			Course Title: Physics -I				
Compulsory / Optional: Compulsory							
Teaching Scheme and Credits					Examination Scheme		
L	T	P	Hours/Week	Credit	PE	Final	Total
3	0	0	3	3	50	50	100

RATIONALE: This course provides the fundamental concepts of Engineering Physics required for understanding various engineering applications. It develops knowledge of measurement systems and error analysis, principles of mechanics, properties of matter and fluids, and heat transfer and thermodynamic processes. The course helps students build analytical and problem-solving skills while establishing a strong foundation for advanced engineering and technology courses.

COURSE OUTCOMES

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

CO1	Understand principles of measurements and dimensional analysis.
CO2	Analyze motion and force systems using Newtonian mechanics.
CO3	Explain gravitation, work, energy and power.
CO4	Evaluate mechanical properties of solids and fluids.
CO5	Apply laws of heat transfer and thermodynamics in engineering systems.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Measurements and Error Analysis 1.1. Physical quantities and units, Fundamental and derived quantities, SI system of units 1.2. Scalar and vector quantities, Dimensions and dimensional analysis 1.3. Principle of homogeneity, Significant figures 1.4. Errors in measurements- Absolute, relative and percentage errors 1.5. Introduction to differential and integral calculus in Physics 1.6. Engineering applications of measurements Course Outcome: CO1 Time : 8 hrs
2	Engineering Mechanics Fundamentals 2.1 Distance, displacement, velocity and acceleration 2.2 Equations of motion, Motion under gravity 2.3 Projectile motion, Circular motion 2.4 Momentum and impulse, Newton's laws of motion 2.5 Friction and its engineering applications 2.6 Motion of elevators and connected bodies Course Outcome: CO2 Time: 10
3	Gravitation, Work and Energy 3.1 Newton's law of gravitation, Variation of acceleration due to gravity 3.2 Gravitational potential energy, Escape velocity 3.3 Artificial satellites, Kepler's laws 3.4 Work, power and energy 3.5 Conservation of energy, Kinetic and potential energy Course Outcome: CO3 Time : 8 hrs

4	Mechanical Properties of Matter and Fluids 4.1 Elasticity: Stress and strain, Hooke's law, Young's modulus, Bulk modulus, Modulus of rigidity 4.2 Surface Tension: Surface tension and surface energy, Capillarity, Angle of contact, Meniscus 4.3 Fluid Mechanics: Density and pressure, Pascal's law, Archimedes principle, Bernoulli's theorem, Viscosity, Streamline and turbulent flow, Reynolds number, Stoke's law Course Outcome: CO4 Time : 10 Hrs
5	Heat and Thermodynamics 5.1 Modes of heat transfer 5.2 Thermal expansion of solids 5.3 Gas laws: Boyle's law, Charles law, Gay-Lussac law 5.4 Ideal gas equation 5.5 Isothermal, adiabatic, isobaric and isochoric processes 5.6 Zeroth law of thermodynamics 5.7 First and Second law of thermodynamics Course Outcome: CO5 Time : 8 hrs

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	1. Physics Part-I Textbook for Class XI	National Council of Educational Research and Training (NCERT)	ISBN-81-7450-508-3
2.	2. Concepts of Physics by H C Verma Part-I	H.C Verma, Bharati Bhawan.	ISBN-13 978-8177091878
3.	Question Bank Physics For Class XI	Tata McGraw-Hill, publisher, McGraw-Hill Education (India) Pvt Limited.	ISBN, 0070221952
4.	Modern ABC of Physics - Class XI	Modern Publishers Satish K. Gupta	ISBN:9789388352383
5.	S. Chand's Principles of Physics For class XI	S. Chand & Company LTD., V.K. Mehta, Rohit Mehta,	ISBN:9788121919340
6.	ISC Physics Book - 1 for Class XI	S.Chand (G/L) & Company Ltd D.K. Benerjee P. Vivekanandan	ISBN 9788121918978 (ISBN10: 8121918979)

E-REFERENCES:

1. <http://www.freebookcentre.net>
2. <http://www.msuniv.ac.in>
3. <https://e-booksdirctory.com>
4. <https://www.infobooks.org>

CO VS PO MAPPING

CO	PO						
	1	2	3	4	5	6	7
CO1	3	2	–	3	–	–	1
CO2	3	3	2	2	–	–	1
CO3	3	2	2	1	2	–	1
CO4	3	3	2	2	1	–	1
CO5	3	3	3	2	2	1	1

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CHEMISTRY-I

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DBS26105			COURSE TITLE: CHEMISTRY-I				
COMPULSARY / OPTIONAL: COMPULSORY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE: Provide basic knowledge of Chemistry and its application for understanding the concepts of engineering and technology.

COURSE OUTCOMES: After successful completion of the Chemistry-I course, the students will be able to:

CO1	Develop fundamental understanding of basic chemical principles numerical methods, and problem-solving techniques in engineering and industrial applications.
CO2	Enhance scientific attitude, analytical thinking, and practical knowledge necessary for multidisciplinary engineering fields and build a strong foundation for advanced studies in engineering sciences, environmental studies, and industrial technologies.
CO3	Understand atomic structure, periodic properties, and chemical bonding for explaining the behavior of materials and substances.
CO4	Analyze chemical equilibrium, pH, buffer systems, and related chemical processes used in laboratory and industrial practices which will help to liaise with industry.
CO5	Understand the principles and applications of modern method of electrochemistry, electrolysis, batteries, fuel cells, and corrosion-related processes.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	TITLE: Mole Concept and Solution 1.1 Mole concept, Avogadro's number, atomic weight, molecular weight Atomic mass unit (a.m.u.) 1.2 Concept of Equivalent weight of acids, bases & salts 1.3 Concentration terms (Molarity, Normality and molality) with numerical 1.4 Oxidation number 1.5 Stoichiometry: problems based on chemical calculation Course Outcome: CO1 Time: 8 hrs
2	TITLE: Atomic structure 2.1 Rutherford's nuclear model of atom, Bohr's atomic model and its drawbacks, and hydrogen spectrum explanation based on Bohr's model of atom 2.2 Orbit and orbital, atomic number, mass number, Isotopes and Isobars 2.3 Quantum numbers – orbital concept. Shapes of s, p and d orbitals, 2.4 Hund's rule, Pauli's exclusion principle, Aufbau's rule, Electronic configuration (up to atomic no. 30), 2.5 Dual nature of matter (de Broglie relationship), Heisenberg's uncertainty principle Course Outcome: CO2 Time: 8 hrs
3	TITLE: Periodic table and Chemical bonding 3.1 Modern periodic table, Characteristics of s, p, d & f block elements

	3.2 Periodic properties and its trends (Atomic radius, Ionization energy, Electron affinity and Electronegativity) 3.3 Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding and covalent bonding with examples. 3.4 VSEPR Theory, hybridisation (predicting shape and structure of molecules and ions) 3.5 Hydrogen bonding & metallic bonding. Course Outcome: CO3 Time: 8 hrs
4	TITLE: Chemical and ionic equilibrium 4.1 Concept of chemical equilibrium, law of mass action 4.2 Ostwald's dilution law, ionic product of water 4.3 pH value, relation between pH & pOH, numerical problems based on pH 4.4 Common ion effect and buffer solutions, Henderson Equation 4.5 Solubility and solubility product Course Outcome: CO4 Time: 8 hrs
5	TITLE: Electrochemistry 5.1 Definition of terms: electrolytes, non-electrolytes with suitable examples, 5.2 Faradays laws of electrolysis and simple numerical problems. 5.3 Industrial Application of Electrolysis – • Electrometallurgy • Electroplating • Electrolytic refining. 5.4 Application of redox reactions in electrochemical cells 5.5 • Primary cells – dry cell, • Secondary cell - commercially used lead storage battery, fuel and Solar cells. Course Outcome: CO5 Time: 8 hrs

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	NCERT CHEMISTRY For Class XI & XII	NCERT, 2018	81-7450-648-9
2.	Pradeep's New Course Chemistry for Class 11&12 (Vol. 1 & 2)	S.C. Kheterpal, S. N. Dhawan, Pradeep, 2020	9789391966355
3.	The Language of Chemistry or Chemical Equation	G.D Tuli & P.L.Soni, 2025	ISBN-10. 9788121925327
4.	Engineering Chemistry	Shashi Chawla, Dhanpat Rai & Co.3 rd edition, 2017	ASIN: B01MUBN7F2
5.	Engineering Chemistry	Jain & Jain, Dhanpat Rai, 17 th edition, 2018	9352165721

E-REFERENCES:

1. <https://ncert.nic.in/textbook.php?lechl=ps-9>
2. <http://www.tndte.gov.in/site/wp-content/uploads/2016/08/Engineering-Chemistry.pdf>

CO vs PO Mapping

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	2	3	2	2
CO2	3	2	3	2	2	2	0
CO3	3	3	3	2	3	3	2
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

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COMMUNICATION SKILLS

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DHS26101			COURSE TITLE: COMMUNICATION SKILLS				
COMPULSORY / OPTIONAL: COMPULSORY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
2	0	0	2	2	50	50	100

Rationale:

This course enables the students:

1.	To make the students confident of speaking in English impeccably and with utmost enthusiasm.
2.	To familiarize the students with different styles of communication.
3.	To enlighten the students with the seven concepts of communication.
4.	To make the students understand the nuances of communication.
5.	To train the students and make them comprehend various aspects of Interview skills.

COURSE OUTCOMES

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

1.	Develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others.
2.	Understand and practice different techniques of communication.
3.	Practice and adhere to the 7Cs of Communication.
4.	Familiarize with different types of Communication.
5.	Understand and practice Interview Etiquette.

COURSE CONTENTS DETAILS

MODULE	TOPICS/SUBTOPICS
1	Communication: An Introduction 1.1 Definition, Nature, and Scope of Communication 1.2 Importance and Purpose of Communication, 7 C's of Communication. 1.3 Process of Communication 1.4 Types & flow of Communication Course Outcome: CO1 Time: 6 hrs
2	Understanding and Applying Vocabulary 2.1 Words Often Confused-Pairs of words. 2.2 One Word Substitutes 2.3 Synonyms and Antonyms 2.4 Word Formation: Prefixes, Bases, and Suffixes. Course Outcome: CO2 Time: 6 hrs
3	Effective Writing Skills 1 Summarizing 2 Précis Writing 3 Paragraph Writing

	4 Letter Writing (formal and informal) Course Outcome: CO3 Time: 6 hrs
4	English Grammar and Usage 1 Articles 2 Parts of Speech 3 Tenses 4 Error Analysis (Correction of Errors in a given sentence) Course Outcome: CO4 Time : 6 hrs
5	Presentation Skills 5.1 Preparing a PowerPoint Presentation 5.2 Presenting a Paper 5.3 Group Discussions 5.4 Extempore/Debates Course Outcome: CO5 Time: 6 hrs

Text Books:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Communication Skills	Sanjay Kumar & Pushp Lata, Oxford University Press 2 nd edition	9780199457069
2.	Communication for Business	Shirley Taylor, V.Chandra, Pearson	9788131727652
3.	Communication Skills I	Archana Sharma, Dr. Gyaneshwar Pratap Singh, Dr.Ombir Singh. Asian Publications	978-93-5502-019-2
4.	Common Mistakes in English	Fitikidies, T.J – Orient Longman, 1984	978-0582344587
5.	English Grammar, Composition and Usage	NK Aggarwal and FT Wood; Published by Macmillan Publishers India Ltd; New Delhi.	978-8183896160

E-REFERENCES:

1. <https://nptel.ac.in/course.html>
2. <https://swayam.gov.in>
3. <https://learnenglish.britishcouncil.org>
4. <https://www.bbc.co.uk/learningenglish>
5. <https://owl.purdue.edu>

CO vs PO Mapping

CO	PO						
	1	2	3	4	5	6	7
CO1	1	2	1	0	2	3	2
CO2	1	2	1	1	1	2	2
CO3	1	2	1	0	2	3	2
CO4	1	1	0	0	1	2	1
CO5	1	1	1	0	2	3	3

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INTRODUCTION TO COMPUTING AND PROGRAMMING

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DES26101			COURSE TITLE: INTRODUCTION TO COMPUTING AND PROGRAMMING				
COMPULSORY / OPTIONAL: COMPULSORY							
TEACHING SCHEME AND CREDITS					EXAMINATION SCHEME		
L	T	P	H/W	CR	PE	FINAL	TOTAL
3	0	0	3	3	Q-20, TA-5, MID-25	50	100

RATIONALE

In the modern digital and AI-driven era, basic computing knowledge and problem-solving skills have become essential for students of all engineering disciplines. This course introduces students to the fundamental concepts of computer hardware, software, and programming, and develops logical thinking through structured problem solving using the C programming language. The course aims to build computational thinking and programming confidence, enabling students to effectively use computing tools and develop simple software solutions relevant to engineering applications across various domains.

COURSE OUTCOMES

CO1	Identify various computer hardware components and explain the basic organization and working of computer systems.
CO2	Differentiate between different types of software and describe the functions of operating systems, language translators, and utility software.
CO3	Develop simple C programs using variables, operators, expressions, and input-output statements.
CO4	Apply selection constructs to develop logical and decision-making programs for solving engineering and real-life problems.
CO5	Develop iterative and repetitive logic-based programs using looping constructs in C programming.

COURSE CONTENT DETAILS:

MODULE	TOPICS
MODULE 1	COMPUTER HARDWARE COMPONENTS 1.1 Introduction to Computer Systems 1.2 Functional Units of a Computer 1.3 Input Devices and Output Devices 1.4 Primary and Secondary Memory Devices 1.5 CPU, ALU and Control Unit 1.6 Storage Devices and their Applications 1.7 Ports, Interfaces and Peripheral Devices 1.8 Classification of Computers Course Outcome: CO1 Time: 5Hrs

MODULE 2	COMPUTER SOFTWARE 2.1 Introduction to Software 2.2 System Software and Application Software 2.3 Operating Systems and their Functions 2.4 Language Translators: Compiler, Interpreter and Assembler 2.5 Utility Software and Device Drivers 2.6 Introduction to Open Source Software 2.7 Programming Languages: Low-Level and High-Level Languages 2.8 Software Applications in Engineering and Daily Life Course Outcome: CO1, CO2 Time: 5Hrs
MODULE 3	INTRODUCTION TO C PROGRAMMING 3.1 Introduction to Algorithms and Flowcharts 3.2 Structure of a C Program 3.3 Character Set, Tokens and Keywords 3.4 Variables, Constants and Data Types 3.5 Input and Output Functions 3.6 Arithmetic Operators and Expressions 3.7 Relational and Logical Operators 3.8 Operator Precedence and Type Conversion 3.9 Writing and Executing Simple C Programs 3.10 Debugging and Programming Errors Course Outcome: CO3 Time: 10Hrs
MODULE 4	LOGIC DEVELOPMENT – SELECTION CONSTRUCTS 4.1 Concept of Decision Making 4.2 if Statement 4.3 if-else Statement 4.4 Nested if-else 4.5 else-if Ladder 4.6 switch-case Statement 4.7 Conditional Operator 4.8 Menu-Driven Programs 4.9 Problem Solving using Selection Constructs 4.10 Debugging Logical Errors in Decision-Making Programs Course Outcome: CO4 Time: 10Hrs
MODULE 5	LOGIC DEVELOPMENT – ITERATION CONSTRUCTS 5.1 Concept of Iteration and Repetition 5.2 while Loop 5.3 do-while Loop 5.4 for Loop 5.5 Nested Loops 5.6 break and continue Statements 5.7 Simple Pattern Programs 5.8 Programs involving Series and Number Processing 5.9 Logic Building using Iterative Constructs 5.10 Debugging and Testing Loop-Based Programs Course Outcome: CO5 Time: 10Hrs

REFERENCE BOOKS

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN
1	Programming in C	Ashok N. Kamthane, Pearson India, 2025	9789367138595
2	Computer Fundamentals and Programming in C	Reema Thareja, Oxford University Press	9780198078883

3	Effective C: An Introduction to Professional C Programming	Robert C. Seacord, No Starch Press, 2020	9781718501041
4	C How to Program	Harvey Deitel and Paul Deitel, Pearson Education, 8th Edition, 2020	9789673498093
5	Code: The Hidden Language of Computer Hardware and Software	Charles Petzold, Microsoft Press, Updated Edition, 2022	9780137909100

E-REFERENCES

1. <https://nptel.ac.in/courses/106105171>
2. <https://www.geeksforgeeks.org/c-programming-language/>
3. <https://www.programiz.com/c-programming>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	2	1	1	2
CO2	3	1	1	2	2	1	2
CO3	2	3	2	3	1	1	3
CO4	2	3	3	2	1	1	3
CO5	2	3	3	2	1	1	3

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PHYSICS LAB-I

Programme: Diploma In Engineering							
Course Code: DBS26102			Course Title: Physics Lab -I				
Compulsory / Optional: Compulsory							
Teaching Scheme and Credits					Examination Scheme		
L	T	P	Hours/Week	Credit	PE	Final	Total
3	0	0	3	3	50	50	100

RATIONALE: Physics Lab-I is designed to provide students with practical exposure to the fundamental principles of mechanics, properties of matter, fluids, and heat. The laboratory experiments enable students to understand scientific concepts through observation, measurement, experimentation, and data analysis. The course develops essential engineering skills such as precision measurement, error analysis, interpretation of experimental results, and preparation of technical reports. The practical knowledge gained through these experiments forms the foundation for understanding engineering applications involving materials, mechanical systems, fluid flow, and thermal processes.

COURSE OUTCOMES

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

CO1	Perform measurements using basic laboratory instruments such as Vernier Calliper and Screw Gauge with appropriate precision.
CO2	Determine physical parameters of solids and mechanical systems through experiments involving volume measurement, simple pendulum, Hooke's law, and spring constant.
CO3	Investigate the properties of fluids by determining surface tension, viscosity, and verifying Bernoulli's principle.
CO4	Evaluate thermal properties of materials through experiments on thermal expansion and specific heat capacity.
CO5	Analyze experimental observations, estimate errors, prepare laboratory reports, and interpret results using scientific principles.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	1.1. Measurement using Vernier Calliper. 1.2. Measurement using Screw Gauge. Course Outcome: CO1, CO5 Time : 4 hrs
2	2.1 Determination of volume of regular solids. 2.2 Determination of acceleration due to gravity using Simple Pendulum. 2.3 Verification of Hooke's Law. 2.4 Determination of spring constant. Course Outcome: CO2, CO5 Time: 8hrs
3	3.1 Determination of surface tension by capillary rise method. 3.2 Determination of coefficient of viscosity. 3.3 Verification of Bernoulli's principle (demonstration). Course Outcome: CO3, CO5 Time : 6 hrs
4	4.1 Study of thermal expansion of solids. 4.2 Determination of specific heat capacity. Course Outcome: CO4, CO5 Time : 4 Hrs

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of Publication	ISBN
1	Engineering Physics Laboratory Manual	S. P. Basavaraj & P. M. Hiremath, Wiley India Pvt. Ltd., 1st Edition, 2015	9788126556095
2	A Textbook of Practical Physics	Indu Prakash & Ramakrishna, Kitab Mahal Publishers, 12th Edition, 2020	9788122505707
3	Advanced Practical Physics for Students	B. L. Flint & H. T. Worsnop, Asia Publishing House, Reprint Edition, 2018	9788123909474

E-REFERENCES:

1. <http://hyperphysics.phy-astr.gsu.edu>
2. <https://openstax.org/subjects/science>
3. <https://nptel.ac.in/courses/physics>

CO VS PO MAPPING

CO	PO						
	1	2	3	4	5	6	7
CO1	3	2	-	3	-	-	1
CO2	3	3	1	3	-	-	1
CO3	3	3	1	3	2	-	1
CO4	3	2	1	3	2	-	1
CO5	2	3	2	3	1	1	2

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CHEMISTRY LAB - I

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DBS26104			COURSE TITLE: Chemistry Lab - I				
COMPULSARY / OPTIONAL: COMPULSORY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	FINAL	TOTAL
0	0	2	2	1	60	40	100

COURSE OUTCOMES: After successful completion of Chemistry Lab – I, the students will be able to:

CO1	Perform quantitative chemical analysis using standard laboratory apparatus, purification techniques such as crystallization, volumetric techniques, and titration methods safely and accurately.
CO2	Prepare standard solutions and apply acid–base, redox, and gravimetric analytical methods for estimation and chemical calculations.
CO3	Analyze the quality of water and understand its importance in domestic, industrial, and environmental applications.
CO4	Identify basic anions and cations through systematic qualitative analysis.
CO5	Develop practical laboratory skills, observation ability, analytical thinking, record keeping, and safe handling of chemicals required for engineering and industrial applications.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	TITLE Quantitative Analysis 1.1 To find the volume of one drop of water. 1.2 Preparation of standard solution of Sodium Carbonate/oxalic acid. 1.3 Estimation of Sodium Hydroxide with the help of standard HCl solution. Course Outcomes: CO1, CO5 Time : 6 hrs
2	TITLE Titration related to Redox Reaction 2.1 Estimation of Mohr's salt using standard KMnO_4 . 2.2 To determine the pH of given solution by the colourimetry method. Course Outcomes: CO1, CO2, CO5 Time : 4 hrs
3	TITLE Gravimetric Practical 3.1. To determine the strength of silver ions in a given solution of AgNO_3 using chloride ion. 3.2. Estimation of Barium as Barium Sulphate. Course Outcomes: CO2, CO3, CO5 Time : 4 hrs
4	TITLE: Crystallisation 4.1 Crystallisation of impure sample of any one of the following: Alum / Copper Sulphate/ Benzoic acid. Course Outcomes: CO1 , CO4, CO5 Time : 2 hrs
5	TITLE Qualitative Analysis.

	5.1 Determination of one anion and one cation in a given salt (4 different salts) Cation- Pb^{2+} , Cu^{2+} , Al^{3+} , Fe^{3+} , Mn^{2+} , Ni^{2+} , Zn^{2+} , Co^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Mg^{2+} , NH_4^+ Anion- CO_3^{2-} , S^{2-} , NO_2^- , SO_3^{2-} , SO_4^{2-} , NO_3^- , Cl^- , Br^- , I^- , PO_4^{3-} , $\text{C}_2\text{O}_4^{2-}$, CH_3COO^- . Course Outcomes: CO4,CO5 Time : 8 hrs
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REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Laboratory Manual on Engineering Chemistry	S.K Bhasin, Sudha Rani(Author) Dhanpat Rai Publishing Company.(New Edition)	ISBN-10. 8187433132
2.	Textbook of Engineering Chemistry with Lab Manual of Chemistry & Environmental Studies	Shashi Chawla, Dhanpat Rai & Co. 2017	ISBN-10 8177000985
3.	Laboratory Manual Chemistry	NCERT, 2025	ISBN 978-81-7450-841-6

E-REFERENCES:

1. <https://vlab.amrita.edu/>
2. <https://nptel.ac.in/courses/104>
3. https://chem.libretexts.org/Bookshelves/Analytical_Chemistry

CO VS PO MAPPING

CO	PO						
	1	2	3	4	5	6	7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	2	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Birla Institute of Technology, Mesra, Ranchi

(UNIVERSITY POLYTECHNIC)

Course Structure for Diploma in Engineering

Based on NEP-2020, CBCS and OBE, Effective from 2026-2027

COMPUTING AND PROGRAMMING LAB

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DES26102			COURSE TITLE: COMPUTING AND PROGRAMMING LAB				
COMPULSORY / OPTIONAL: COMPULSORY							
TEACHING SCHEME AND CREDITS					EXAMINATION SCHEME		
L	T	P	Hr/Wk	Cr	PE	FINAL	TOTAL
0	0	2	2	1	50	50	100

RATIONALE: This laboratory course provides practical exposure to computer systems, software tools, and fundamental programming using C. It develops computational thinking, problem-solving abilities, and programming skills through hands-on exercises and projects, thereby establishing a strong foundation for advanced computing courses.

COURSE OUTCOMES

CO1	Identify and operate various computer hardware components, peripherals, and operating system utilities for basic system management tasks.
CO2	Utilize productivity software, internet applications, and cloud-based tools for creating, managing, and sharing digital content.
CO3	Develop simple C programs using variables, data types, operators, input/output statements, and expressions to solve basic computational problems.
CO4	Implement decision-making constructs in C programming to develop solutions involving conditional logic and menu-driven applications.
CO5	Design and execute iterative C programs using looping constructs to solve numerical, pattern-based, and real-world computational problems.

LIST OF EXPERIMENTS / PROGRAMMING PROBLEMS

MODULE	TOPIC
1	Computer System and Operating System Fundamentals Basic Exercises 1. Identify major hardware components of a desktop computer. 2. Create, rename, copy, move, and delete files and folders. 3. Use file explorer to organize folders. 4. Check system configuration and hardware specifications. 5. Install and uninstall software applications. 6. Compress and extract files using archive tools. 7. Use Task Manager/System Monitor to view running processes. 8. Configure printer and peripheral devices. 9. Perform basic system maintenance (disk cleanup, updates). Assignments/Projects 1. Prepare a report on computer hardware specifications of lab PCs. 2. Create a hardware inventory sheet for a computer lab. 3. Compare Windows and Linux operating systems. 4. Demonstrate installation of a software package and document the process. Course Outcomes:CO1 Time:4Hrs
2	Productivity Tools and Internet Applications Basic Exercises 1. Create a formatted document in a word processor. 2. Prepare a resume using a word processor. 3. Create tables and apply formatting. 4. Create a presentation with animations and transitions. 5. Prepare a spreadsheet with formulas.

	6. Use charts in spreadsheets. 7. Create and manage email accounts. 8. Use cloud storage for file sharing. 9. Search and evaluate information on the Internet. 10. Participate in an online meeting platform. Assignments/Projects 1. Design a college brochure using office tools. 2. Create a student marksheet using spreadsheets. 3. Prepare a presentation on emerging technologies. 4. Develop a digital portfolio containing academic details. Course Outcomes:CO1, CO2 Time:4Hrs
3	C Programming Fundamentals Basic Exercises 1. Write a program to display "Hello World". 2. Perform arithmetic operations on two numbers. 3. Calculate simple interest. 4. Find area and perimeter of basic geometric figures. 5. Convert temperature between Celsius and Fahrenheit. 6. Swap two numbers using a third variable. 7. Swap two numbers without using a third variable. 8. Demonstrate use of different data types. 9. Read and display user input. 10. Evaluate expressions using operators. Assignments/Projects 1. Basic Calculator. 2. Student Information System. 3. Unit Conversion Utility. 4. Electricity Bill Calculator. Course Outcomes:CO3 Time:4Hrs
4	Decision Making in C Basic Exercises 1. Check whether a number is even or odd. 2. Find the largest of two numbers. 3. Find the largest of three numbers. 4. Check leap year. 5. Determine grade from marks. 6. Check whether a character is vowel or consonant. 7. Verify eligibility for voting. 8. Create a simple menu-driven calculator. 9. Check whether a number is positive, negative, or zero. 10. Determine profit or loss. Assignments/Projects 1. Student Grade Processing System. 2. Payroll Calculation System. 3. Banking Transaction Menu Program. 4. Railway Ticket Fare Calculator. Course Outcomes:CO4 Time:4Hrs
5	Iterative Programming in C Basic Exercises 1. Print numbers from 1 to N. 2. Print multiplication table. 3. Find sum of first N natural numbers. 4. Find factorial of a number. 5. Generate Fibonacci series. 6. Reverse a number. 7. Check palindrome number. 8. Check Armstrong number. 9. Count digits in a number. 10. Generate various star patterns.

	Assignments/Projects 1. Number Analysis Tool (prime, palindrome, Armstrong). 2. Pattern Generation System. 3. Quiz Application using loops and menus. 4. Mini ATM Simulation Course Outcomes:CO4 Time:4Hrs
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TEXT BOOKS:

S. No.	Title	Author, Publisher, Year & Edition	ISBN
1	Fundamentals of Computers	V. Rajaraman & N. Adabala; PHI Learning Pvt. Ltd.; 7th Edition, 2025	9789354439612
2	Programming in C	Ashok N. Kamthane; Pearson India; Latest Edition, 2025	9789367138595
3	Computer Fundamentals and Programming in C	Reema Thareja; Oxford University Press; 3rd Edition, 2023	9789354977893
4	Effective C: An Introduction to Professional C Programming	Robert C. Seacord; No Starch Press; 1st Edition, 2020	9781718501041
5	C How to Program	Harvey Deitel & Paul Deitel; Pearson Education; 8th Edition, 2020	9789673498093
6	Code: The Hidden Language of Computer Hardware and Software	Charles Petzold; Microsoft Press; Updated Edition, 2022	9780137909100

E-REFERENCES:

1. <https://nptel.ac.in/courses>
2. <https://www.geeksforgeeks.org/c-programming-language/>
3. <https://www.tutorialspoint.com/cprogramming/index.htm>

CO-PO MAPPING

CO	PO						
	1	2	3	4	5	6	7
CO1	3	1	1	3	1	1	2
CO2	2	1	1	3	1	1	2
CO3	2	3	3	2	1	1	2
CO4	2	3	3	2	1	1	2
CO5	2	3	3	3	1	1	2

Birla Institute of Technology, Mesra, Ranchi
(UNIVERSITY POLYTECHNIC)
Course Structure for Diploma in Engineering
Based on NEP-2020, CBCS and OBE, Effective from 2026-2027

ENGINEERING GRAPHICS

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DES26104			COURSE TITLE: Engineering Graphics				
COMPULSORY / OPTIONAL: COMPULSORY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
		3	3	1.5	60	40	100

RATIONALE: Engineers effective language is an engineering graphics. It provides the basis knowledge, which strengthens the engineering & technological structure. Moreover, it is the Basic tools for cultivating ideas and understanding.

COURSE OUTCOMES

CO1	Learn to use the drawing instruments, understand graphics standards, dimensioning, limits, fits, tolerances, symbol use in technical drawing and drawing scales, in technical drawing development.
CO2	To develop skill to visualise engineering objects and able to draw different engineering curves and know their applications.
CO3	Understand and able to draw the projections of objects in different planes and learn displaying techniques for graphical representation.
CO4	Visualise three- dimensional objects and able to draw orthographic and isometric projections.
CO5	Able to visualise and draw sectional views of solid objects & develop understanding to examine industrial engineering drawing.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	TITLE: Basic Elementary graphics 1.1 Convention of the line and their application 1.2 Dimensioning technique as per SP-46 1.3 Concept limit, fits and Tolerance symbols 1.4 Scale (reduced, enlarged & full scale 1.5 Geometrical Construction Course Outcome: CO1 Teaching & Time : 8 hrs
2	TITLE: Engineering curves and Loci of Points 2.1 To draw an ellipse by: Directrix and focus method, Rectangle method. 2.2 To draw a hyperbola and parabola by: Directrix and focus method, passing through given points. 2.3 to draw involutes of circle & polygon. 2.4 to draw cycloid, epicycloid, hypocycloid. 2.5 to draw helix & spiral. Course Outcome: CO1 Teaching & Time: 8 hrs
3	TITLE: Introduction of projection 3.1 Projection of point 3.2 Projection of lines 3.3 Projection of Plane

	3.4 Projection of simple Plane of circular, square, rectangular object 3.5 Projection of Solid Course Outcome: CO3 Teaching & Time : 8 hrs
4	TITLE Orthographic and Isometric Projection 4.1 introduction to orthographic projections 4.2 Conversion of pictorial view into orthographic Views 4.3 Isometric scale 4.4 Conversion of isometric view into orthographic view 4.5 draw missing view from the given orthographic view Course Outcome: CO4 Teaching & Time : 8 hrs
5	TITLE: Section of solids 5.1 Section of solids of pyramid, Cone and tetrahedron resting on the base. 5.2 Section of solid of prism and cylinder 5.3 Section of prism and cylinder axis parallel to both the reference planes 5.4 section of prism and cylinder resting on their base Course Outcome: CO5 Time : 8 hrs

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1	Bureau of Indian Standards. Engineering Drawing Practice for Schools and Colleges IS: Sp-46	BIS. Government of India, Third Reprint, October 1998	ISBN: 81-7061-091-2.
2	Engineering Drawing	Bhatt, N. D : Charotar Publishing House, Anand, Gujrat 2010	ISBN: 978-93-80358-17-8
3	Engineering Graphics & Design	Jain &Gautam; Khanna Publishing House, New Delhi	ISBN: 978- 93-86173-478

E-REFERENCES:

1. <https://www.youtube.com/watch?v=TJ4jGyDWCw>
2. <https://www.youtube.com/watch?v=dmt6n7Sgcg>
3. <https://www.youtube.com/watch?v=MQScnLXL0M>
4. <https://www.youtube.com/watch?v=3WXPanCq9LI>
5. <https://www.youtube.com/watch?v=fvjk7PlxAuo>
6. <http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf>
7. <https://www.machinedesignonline.com>

CO VS PO MAPPING:

CO	PO						
	1	2	3	4	5	6	7
CO1	3	2	2	3	1	—	1
CO2	3	3	2	2	—	—	1
CO3	3	3	2	3	—	—	1
CO4	3	3	3	3	—	—	1
CO5	3	3	3	2	1	1	2

Birla Institute of Technology, Mesra, Ranchi
(UNIVERSITY POLYTECHNIC)
Course Structure for Diploma in Engineering
Based on NEP-2020, CBCS and OBE, Effective from 2026-2027

SPORTS AND YOGA

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DHS26102			COURSE TITLE: SPORT & YOGA				
COMPULSORY / OPTIONAL: COMPULSORY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
0	0	2	2	1	50	50	100

Rationale:

The course is designed to help students understand the importance of sound health, physical fitness, and overall well-being as essential components of a healthy lifestyle. It exposes students to a variety of physical and yogic activities that encourage continuous learning and active participation in yoga, physical education, health, and fitness practices. The course follows a safe, progressive, systematic, and activity-based approach aimed at enhancing physical capabilities while minimizing the risk of injury. Furthermore, it fosters among students a lifelong appreciation for physical activity and yoga as effective means of maintaining good health, improving quality of life, and achieving holistic personal development.

Course Outcomes:

On successful completion of the course the students will be able to:

CO1	Understand the fundamentals of physical education and the significance of the Olympic movement in promoting sportsmanship and excellence.
CO2	Develop awareness of fitness, wellness, and healthy lifestyle practices for overall physical and mental well-being.
CO3	Understand the functioning of the human body and the physiological effects of exercise and physical activity.
CO4	Apply biomechanical principles to sports activities and recognize the importance of correct posture and corrective exercises.
CO5	Demonstrate participation in yoga and sports activities for enhancing physical fitness, mental well-being and teamwork.

Course Content:

Modules	Topics
1	Introduction to Physical Education and Olympic Movement 1. Meaning, Definition, Aims and Objectives of Physical Education. 2. Changing Trends in Physical Education. 3. Ancient and Modern Olympic Games (Summer and Winter Olympics). 4. Olympic Symbols, Ideals, Objectives and Values. 5. Awards and Honours in Sports in India: Arjuna Award, Dronacharya Award, Major Dhyan Chand Award, Khel Ratna Award and other national sports awards.

	Course Outcome:CO1 Teaching/ Practice Hours:4hrs
2	Physical Fitness, Wellness and Healthy Lifestyle 1. Meaning and Importance of Physical Fitness and Wellness. 2. Components of Physical Fitness. 3. Components of Health-Related Fitness. 4. Dimensions and Components of Wellness. 5. Positive Lifestyle Concepts and Prevention of Health Threats through Lifestyle Modifications. Course Outcome: CO2 Teaching/ Practice Hours:4hrs
3	Fundamentals of Anatomy, Physiology and Exercise 1. Introduction to Anatomy and Physiology. 2. Importance of Anatomy and Physiology in Physical Education, Sports and Yoga. 3. Structure and Functions of Major Body Systems. 4. Effects of Exercise on the Circulatory System. 5. Effects of Exercise on the Respiratory and Neuromuscular Systems. Course Outcome: CO3 Teaching/ Practice Hours:4hrs
4	Kinesiology, Biomechanics and Posture 1. Meaning and Importance of Kinesiology and Biomechanics in Sports. 2. Newton's Laws of Motion and their Applications in Sports Activities. 3. Friction and its Effects in Sports Performance. 4. Meaning, Concept and Importance of Correct Posture. 5. Common Postural Deformities: Knock Knee, Flat Foot, Round Shoulders, Lordosis, Kyphosis, Bow Legs and Scoliosis. 6. Corrective Measures for Postural Deformities. 7. Advantages and Limitations of Weight Training. Course Outcome: CO4 Teaching/ Practice Hours:4hrs
5	Yoga Practices and Sports Activities 1. Introduction to Yoga and its Importance for Health and Fitness. 2. Basic Yogic Practices: Asanas, Pranayama and Relaxation Techniques. 3. Physical Conditioning through Yoga and Sports Activities. 4. Participation in Individual and Team Sports. 5. Recreational and Competitive Sports Activities. 6. Safety Precautions and Ethical Practices in Sports and Yoga. Course Outcome: CO5 Teaching/ Practice Hours:4hrs

TEXT BOOKS:

S. No.	Title	Author, Publisher, Year & Edition	ISBN
1	Health and Physical Education	Dr. V.K. Sharma; Saraswati House Pvt. Ltd.; Revised Edition, 2021	9788173358763
2	Physical Education and Sports Sciences	Dr. Ajmer Singh, Dr. A.P. Pathak & Dr. S.S. Chandel; Kalyani Publishers; 4th Edition, 2020	9789327268389
3	Foundations of Physical Education, Exercise Science and Sports	Deborah Wuest & Jennifer Fisette; McGraw-Hill Education; 20th Edition, 2019	9781260837769
4	Light on Yoga	B.K.S. Iyengar; HarperCollins Publishers India; Reprint Edition, 2015	9788172235010
5	Anatomy and Physiology for Physical Education	Dr. A.K. Uppal & Dr. Gautam; Friends Publications (India); 1st Edition, 2018	9789388457869
6	Physical Fitness and Wellness	Werner W.K. Hoeger & Sharon A. Hoeger; Cengage Learning; 13th Edition, 2021	9780357720250

E-REFERENCES:

1. <https://yas.nic.in>
2. <https://fitindia.gov.in>
3. <https://ayush.gov.in>

CO Vs PO MAPPING:

CO	PO						
	1	2	3	4	5	6	7
CO1	3	1	-	-	2	-	2
CO2	2	1	-	-	3	-	3
CO3	3	2	-	1	2	-	2
CO4	3	2	2	1	2	-	2
CO5	2	1	-	-	3	2	3