

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-II

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DBS26201			COURSE TITLE: MATHEMATICS-II				
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: Provide basic knowledge of Mathematics for understanding the concepts of engineering and technology.

COURSE OUTCOMES

Students will perceive mathematical concepts, principles, and different mathematical methods prerequisite for studying other subjects in engineering fields. Students are going to learn the following topics:

CO1	Students will be able to understand and apply inverse trigonometric functions, represent complex numbers in polar form, and use De-Moivre's theorem and Euler's theorem for solving mathematical problems involving complex numbers.
CO2	Students will be able to analyze continuity and differentiability of functions, apply chain rule and derivative techniques, and evaluate derivatives of inverse trigonometric, logarithmic, exponential, and parametric functions.
CO3	Students will be able to apply derivatives to determine rate of change, identify increasing and decreasing functions, and solve problems related to maxima and minima using derivative tests.
CO4	Students will be able to understand integration as the inverse process of differentiation and solve integrals using substitution, partial fractions, and integration by parts methods to get the deeper idea for this topic.
CO5	Students will be able to evaluate definite integrals using the fundamental theorem of calculus and apply integration techniques to determine areas bounded by simple curves.

COURSE CONTENT DETAILS:

MODULES WITH TOPICS
1. MODULE-I Trigonometric and Complex Functions 1.1. Inverse Trigonometric Functions 1.2. Polar form of Complex Numbers, De-Moivre's theorem (without proof) and related problems, and Euler's Theorem. <i>Course Outcome: CO1 Time: 6 hrs</i>
2. MODULE-II Continuity and Differentiability 2.1. Continuity and differentiability, 2.2. Derivative of composite functions, chain rule, 2.3. Derivatives of inverse trigonometric functions, derivatives of implicit functions. 2.4. Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. <i>Course Outcome: CO2 Time: 8 hrs</i>

3. MODULE-III Applications of Derivatives

3.1. Rate of change of bodies, increasing/decreasing functions.

3.2. Maxima, and minima (first derivative test motivated geometrically and second derivative test given as a provable tool).

*Course Outcome: CO3 Time: 8 hrs***4. MODULE-IV Indefinite Integral**

4.1. Integration as inverse of differentiation. Integration of algebraic and trigonometric functions.

4.2. Integration by substitution,

4.3. Integration by Partial fractions

4.4. Integration by parts.

*Course Outcome: CO4 Time: 10 hrs***5. MODULE-V Definite Integral**

5.1. Fundamental theorem of calculus (without proof), basic properties of definite integral, and evaluation.

5.2. Application of finding the area of simple curves

*Course Outcome: CO5 Time: 6 hrs***TEXT AND REFERENCE BOOKS**

S. N.	Title	Author, Publisher, Edition, and Year of publication	ISBN
5.	Senior Secondary School Mathematics for Class 11	R. S. Agarwal, Bharati Bhavan Publishers & Distributors. 2020	ISBN-13 : 978-9350271476
6.	Senior Secondary School Mathematics for Class 12	R. S. Agarwal, Bharati Bhavan Publishers & Distributors. 2020	ISBN-13 : 978-9350271247
7.	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 Vs PO MAPPING:

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

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PHYSICS-II

Programme: Diploma In Engineering							
Course Code: DBS26203			Course Title: Physics -II				
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: The course intends to

1. Develop understanding of measurement systems and error analysis.
2. Apply principles of mechanics to engineering problems.
3. Understand properties of matter and fluid behaviour.
4. Explain heat transfer and thermodynamic processes.
5. Build a foundation for advanced engineering sciences.

COURSE OUTCOMES

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

CO1	Analyze wave motion and acoustics.
CO2	Explain optical phenomena and optical instruments.
CO3	Apply principles of electricity and electrostatics.
CO4	Analyze magnetic and electromagnetic systems.
CO5	Apply engineering mechanics concepts in engineering applications.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Waves and Acoustics 1.1 Types of waves, Wave parameters, Superposition principle 1.2 Velocity of sound, Doppler effect, Acoustics of buildings 1.3 Reverberation, Echo, Beats 1.4 Noise control in engineering systems Course Outcome: CO1 Time : 8 hrs
2	Optics and Photonics 2.1 Reflection and refraction, Total internal reflection 2.2 Prism and dispersion, Interference of light 2.3 Young's double slit experiment, Photometry 2.4 Optical fibres and applications 2.5 LASER fundamentals and applications Course Outcome: CO2 Time: 8Hrs
3	Electricity and Electrostatics 1.1 Electric charge and current, Conductors, semiconductors and insulators 1.2 Ohm's law, Series and parallel circuits, Electrical power and energy 1.3 Wheatstone bridge, Galvanometer, ammeter and voltmeter 1.4 Coulomb's law, Electric field and electric potential, Electric dipole 1.5 Engineering applications Course Outcome: CO3 Time : 10 hrs
4	Magnetism, Electromagnetic Induction and Modern Physics 4.1 Magnetic properties, Magnetic field and flux, Biot-Savart law 4.2 Magnetic field due to conductor, coil and solenoid, Earth's magnetism 4.3 Faraday's laws of electromagnetic induction, Electromagnetic applications

	4.4 Photoelectric effect, X-rays, Radioactivity, Nuclear energy 4.5 LASER applications Course Outcome: CO4 Time : 10 Hrs
5	Applied Mechanics for Engineers 5.1 Statics: Force systems, Resultant and equilibrium of coplanar forces, Polygon law of forces, Law of moments, Friction and applications 5.2 Engineering Structures: Centroid and centre of gravity, Moment of inertia 5.3 Strength of Materials: Stress and strain, Elastic constants, Introduction to bending and torsion 5.4 Dynamics: Kinematics and kinetics, Flywheel and screw jack, Engineering applications Course Outcome: CO5 Time : 8 hrs

REFERENCE BOOKS:

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

E-REFERENCES:

1. <https://ocw.mit.edu/courses/physics/>
2. <http://hyperphysics.phy-astr.gsu.edu>
3. <https://www.khanacademy.org/science/physics>

CO VS PO MAPPING

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

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CHEMISTRY-II

PROGRAMME: DIPLOMA IN ALL ENGINEERING BRANCHES							
COURSE CODE: DBS26205			COURSE TITLE: CHEMISTRY-II				
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: This course introduces the fundamental concepts of engineering chemistry and their applications in engineering and industrial processes. It provides knowledge of water treatment, metallurgy, polymers, fuels, combustion, corrosion, and lubricants, which are essential for understanding material behavior and industrial operations. The course helps students develop scientific understanding and problem-solving skills required for the efficient utilization of materials, energy resources, and corrosion control in engineering practice.

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

CO1	Apply the fundamental principles of chemistry for solving engineering and industrial problems.
CO2	Understand the structure, properties, and behavior of chemical substances, materials, fuels, polymers, metals, and electrochemical systems used in engineering applications.
CO3	Analyze water treatment processes, corrosion phenomena, lubrication systems, and fuel technologies relevant to industrial practices.
CO4	Understand the environmental, industrial, and technological significance of chemical processes and materials in multidisciplinary engineering fields.
CO5	Build a strong foundation for advanced studies, research, and professional applications in engineering and allied technologies.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Water Technology 1.1 Hardness of water (Soft water & hard water), Units of hardness. 1.2 Action of Soap and detergent, Temporary & Permanent Hardness 1.3 Water Treatment- Lime Soda, Zeolite and Ion exchange method.. 1.4 Boiler feed water, Scale & Sludge formation, Priming and foaming as troubles and remedial measures Course Outcome: CO1 Time : 8 hrs
2	Metallurgy 2.1 Definition of metallurgy related term like Ore, Mineral, Gangue (matrix), Flux, Slag.. 2.2 General Process of Extraction 2.3 Extraction of - Iron from haematite ore using blast furnace. (Reactions and Fig) 2.4 Extraction of Aluminium from bauxite along with reactions. (Reactions and Flowsheet) 2.5 Alloys –Brass, Bronze, Stainless steel, Duralumin, Solder, Gun metal General chemical composition & applications Course Outcome: CO2 Time: 8 hrs
3	Polymers 3.1 Homologous series, Functional groups & Nomenclature of organic compounds.

	3.2 Polymers, , monomer, homo and co polymers Polymerization- addition & condensation with examples 3.3 Thermoplastics and thermosetting plastics 3.4 Application of Polymers and the uses, (PVC, PS, PTFE, nylon – 6, nylon-6,6 and Bakelite), 3.5 Rubber and vulcanization of rubber. Course Outcome: CO3 Time: 8 hrs
4	Fuel & Combustion 4.1 Definition, classification and combustion of fuels 4.2 Calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula 4.3 Refining of crude oil, Fuel Petrol and diesel, Knocking- fuel rating (octane and cetane numbers), 4.4 Proximate and Ultimate Analysis of coal. 4.5 LPG, CNG, water gas, coal gas, producer gas and biogas. Course Outcome: CO4 Time : 8 hrs
5	Corrosion & Lubricants 5.1 Corrosion, Types of corrosion: Galvanic, Waterline, Stress, Pitting , Errosion. factors affecting rate of corrosion . 5.2 Protection against corrosion : Purification, alloying and heat treatment and External corrosion preventive measures: (a) metal (anodic, cathodic) (b) organic coatings, 5.3 Lubricant, Definition, classification of lubricants with examples, and characteristic properties of good lubricant. 5.4 Lubrication – function, lubrication mechanism – hydrodynamic and boundary lubrication, physical proper-ties (viscosity and viscosity index, oiliness,. and chemical properties 5.5 Flash and fire point, cloud and pour point Course Outcome: CO5 Time : 8 hrs

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Engineering Chemistry	Shashi Chawla, Dhanpat Rai & Co.3 rd edition, 2017	ASIN: B01MUBN7F2
2.	Engineering Chemistry	Jain & Jain, Dhanpat Rai, 17 th edition, 2018	9352165721
3.	Modern abc of Chemistry part-1, class XII	Jahur, Modern Publishers, 2014-2015	978-93-83907-23-6
4.	Pradeep's New Course Chemistry for Class 11&12 (Vol. 1 & 2)	S.C. Kheterpal, S. N. Dhawan, Pradeep, 2020	9789391966355

E-REFERENCE:

1. <https://nptel.ac.in/course.html>
2. <https://chem.libretexts.org>
3. <https://edu.rsc.org>

CO vs PO Mapping

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
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

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BASICS OF ELECTRICAL & ELECTRONICS

PROGRAMME: DIPLOMA IN ENGINEERING										
COURSE CODE: DES26203			COURSE TITLE: BASICS OF ELECTRICAL & ELETRONICS							
COMPULSORY / OPTIONAL: COMPULSORY										
Teaching Scheme and Credits					EXAMINATION SCHEME					
L	T	P	HOURS/WEEK	CREDIT	QUIZ I	MID	QUIZII	ASSESSMENT	FINAL	TOTAL
3	0	0	3	3	10	25	10	05	50	100

Rationale: This course introduces the fundamental concepts of electrical and electronics engineering that form the basis of modern technological systems. It provides knowledge of electrical circuits, machines, electronic components, and basic electronic devices, enabling students to understand their operation and applications. The course develops analytical and practical skills essential for studying advanced engineering subjects and working with electrical and electronic systems in various engineering fields.

COURSE OUTCOMES

CO1	Apply the concepts of electrical elements, sources, Ohm's Law, and circuit transformation techniques in electrical circuit analysis.
CO2	Analyze DC electrical circuits using KCL, KVL, mesh, nodal, super-mesh, and super-node methods.
CO3	Explain the generation and representation of alternating quantities and calculate RMS, average, and phasor values.
CO4	Differentiate semiconductor materials, diodes, transistors and logic gates based on their construction, operation, characteristics and applications in practical systems.
CO5	Construct and verify simple digital logic circuits using basic and universal gates while observing safety practices in electrical and electronic systems.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Electrical Components and sources 1.1 Electrical Elements R, L & C and its applications and factors. 1.2 Electrical sources: independent, Dependent, Real & Ideal sources. 1.3 Series and parallel, Voltage & current division rule. 1.4 Star-Delta Transformation & Source Transformation. 1.5 Ohm's Law and its applications <i>Course Outcome: CO1, CO2</i> <i>Time : 7 hrs</i>
2.	Applications of KCL & KVL in DC Circuit 2.1 introduction of KCL & KVL 2.2 KCL & KVL using independent and dependent source. 2.3 Mesh/Loop analysis 2.4 Node analysis

	2.5 Super- Mesh & Super- Node analysis. Course Outcome: CO1, CO2, CO3. Time : 7 hrs
3.	GENERATION OF ALTERNATING QUANTITIES 3.1 Introduction and Generation of Alternating Voltages. 3.2 Terms Related to Alternating Quantities. 3.3 Root mean square (rms) or effective value and Average value of a Sinusoidal Waveform 3.4 Phasor representations of alternating quantities. 3.5 Mathematical representations of phasors. 3.6 Power, Power factors and its significations. Course Outcome: CO1, CO3, CO5. Time : 7 hrs
4.	INTRODUCTION TO SEMICONDUCTOR MATERIALS & COMPONENTS 4.1 Classification of materials: Energy bands, Forbidden band, Conductor, Semiconductor, Insulator, Intrinsic & Extrinsic semiconductors. 4.2 Diode: PN junction, Diode characteristics. DC load line, AC load line. 4.3 Zener Diode: V-I characteristics, Applications of Zener diode. 4.4 Introduction to BJT: Concept of transistors as two junctions, three terminal devices with two current carriers. 4.5 Types and working of BJT: PNP and NPN transistors, their symbols and mechanism of current flow; 4.6 Explanation of fundamental current relation. Course Outcome: CO3, CO4 Time : 7 hrs
5.	INTRODUCTION TO DIGITAL ELECTRONICS 5.1 Concept of positive logic and negative logic. 5.2 Basic Gates: Definition, Symbol and Truth Table. 5.3 Universal Gates: Definition, Symbol and Truth Table. 5.4 Special Gates: Definition, Symbol and Truth Table. 5.5 Construction of basic gates using universal gates. Course Outcome: CO4, CO5 Time : 7 hrs

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1	Basics of Electrical, Electronics and Communication Engineering	K.A.NAVAS & T.A.Suhail , Rajath Publishers, Kochi.	978-8192189475
2	Fundamental Electrical and Electronic Principles (Third Edition)	Christopher R Robertson, Newnes, Elsevier	978-0750687379
3	Basic Electronics & Linear Circuits	N.N.Bhargava, D.C. Kulashreshtha, S.C. Gupta- TTTI Chandigarh, TMH.	978-1259006463
4	Electronic Devices & Components	Allen Mottershead, PHI	978-8120301245

E-REFERENCES:

1. www.circuitglobe.com
2. www.courses.lumenlearning.com
3. www.allaboutcircuits.com

CO vs PO Mapping:

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	0	1	1	0	1
CO2	3	3	1	2	1	0	1
CO3	3	3	2	2	1	0	1
CO4	3	2	2	1	1	0	1
CO5	2	2	3	3	2	1	1

FUNDAMENTALS OF ENGINEERING

PROGRAMME: DIPLOMA IN Engineering							
COURSE CODE: DES26203			COURSE TITLE: FUNDAMENTALS OF ENGINEERING				
COMPULSORY: Engineering Science							
TEACHING SCHEME AND CREDITS					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	-	-	3	3	50	50	100

COURSE OBJECTIVES: This course enables the students to

1.	Explain the classification, properties, applications, and sustainability aspects of conventional and modern engineering materials used in engineering practice.
2.	Describe the fundamental components of buildings, building services, modern construction technologies, and their role in the development of smart and sustainable infrastructure.
3	Introduce the system of work, power and energy.
4	Familiarize with the basics of manufacturing processes.
5	Grasp the importance of IC Engine, Boiler etc Get acquainted with the basic concepts and fundamental aspects of IC Engine, Boiler etc.

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

CO1	Explain the properties, applications, and sustainability aspects of conventional and modern engineering materials used in engineering and infrastructure projects.
CO2	Analyze the functions of building components, building services, modern construction technologies, and sustainable infrastructure systems in engineering practice.
CO3	Explain the basics of mechanical engineering.
CO4	Be conversant with the basic manufacturing processes.
CO5	Discuss the fundamental parts , classification of IC Engine,Boiler, Turbine .

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Engineering Materials and Sustainable Development 1.1 Introduction to Engineering Materials: Classification and selection criteria of engineering materials. 1.2 Conventional Construction Materials: Cement, concrete, steel, bricks, timber, and aggregates. Its basic applications. 1.3 Modern Engineering Materials: Fiber-reinforced composites, Self-healing concrete, Shape Memory Alloys and Phase Change Materials. 1.4 Sustainable Materials and Green Construction: Fly ash, slag, recycled materials; Concepts of sustainable development and green buildings Course Outcomes: CO1 Time: 8 hrs
2	Building Construction and Smart Infrastructure 2.1 Basic Building Components: Foundation, walls, floors, roofs, doors, windows, and their functions in a building system. 2.2 Building Services and Thermal Comfort: Ventilation, lighting, thermal comfort, acoustic considerations, and energy-efficient building practices. 2.3 Modern Construction Technologies: Prefabrication and modular construction; 3D concrete printing; introduction to drones and robotics in construction. 2.4 Case Study of a Modern Infrastructure Project. Course Outcomes: CO1, CO2 Time: 8 hrs
3	Introduction to Mechanical Engineering : 3.1 Work, Power, Energy,

	3.2 Heat, Temperature, , Specific heat capacity, Mechanical equivalent of heat, Internal energy, Enthalpy, Entropy 3.3 Statements of Zeroth Law, First law and Second Law of Thermodynamics, 3.4 Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, , Relation between Cp and Cv Course Outcomes: CO3 Time: 8 hrs
4	Workshop Practice Processes : 4.1 Classification of Manufacturing Processes shops, 4.2 Introduction to Fitting, sheet metal, Smithy, Carpentry, welding, and machining. 4.3 Concept of forging, rolling, Type of patterns, Welding : Type of welding, gas welding, gas cutting, arc welding. 4.4 Machine Tools (Drilling machine, Lathe machine). Course Outcomes: CO4 Time: 8 hrs
5	Introduction to steam generator & I.C. engine : 5.1 Introduction to steam generator, Classification 5.2 Simple vertical boiler, Boiler draught. 5.3 Introduction to I.C. Engine, Classification, Engine details, 5.4 Difference between two-stroke and four-stroke cycle, indicated power (ihp), Brake Power (bhp), Efficiencies. Course Outcomes: CO5 Time: 8 hrs

TEXT BOOK:

S. No.	Title	Author, Publisher, Edition & Year of Publication	ISBN
1	Material Science and Engineering	W. D. Callister Jr. & D. G. Rethwisch, Wiley, 10th Edition, 2018	978-1119405498
2	Smart Buildings	M. Eyke, Butterworth-Heinemann, 1st Edition, 2021	978-0128203477*
3	Elements of Mechanical Engineering	K. P. Roy & Prof. S. K. Hajra Choudhury, Media Promoters & Publishers Pvt. Ltd.	978-8190458993
4	Civil Engineering Materials	S. Somayaji, Pearson Education, 2nd Edition, 2020	978-9332551879
5	Sustainability of Construction Materials	J. M. Khatib (Ed.), Woodhead Publishing, 2nd Edition, 2016	978-0081003701
6	Manufacturing Technology, Vol. I & Vol. II	P. N. Rao, Tata McGraw-Hill Education	Vol. I: 978-0070072480; Vol. II: 978-0070072640

E-REFERENCES:

Smart Material, Adaptive Structures and Intelligent Mechanical Systems:

<https://nptel.ac.in/courses/112104173>

CO VS PO MAPPING:

	PO1	PO2	P3	PO4	PO5	PO6	PO7
CO1	3	2	1	0	3	1	1
CO2	3	2	2	1	3	2	1
CO3	2	2	1	1	2	1	1
CO4	3	2	2	2	1	1	3
CO5	2	1	1	2	2	1	3

ENVIRONMENTAL SCIENCES

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DHS26201			COURSE TITLE: Environmental Sciences				
COMPULSORY / OPTIONAL: COMPULSORY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
2	-	-	2	0	50	50	100

RATIONALE: The main aim of environmental education at the diploma level course is to succeed in making individuals and communities understand the complex nature of the natural and the built environments. Further, to acquire the knowledge, values, attitudes, and practical skills to participate in a responsible and effective way in anticipating and solving social problems, and in the management of the quality of the environment.

COURSE OUTCOMES: Students will be able to understand about

CO1	Explain the fundamental concepts of environmental science, ecology, biogeochemical cycles, and food chains, and their significance in maintaining ecological balance.
CO2	Analyze the sources, types, and effects of water pollutants and explain the principles and methods of water treatment.
CO3	Classify air pollutants, evaluate their harmful effects on the environment and human health, and describe appropriate control measures.
CO4	Explain the causes, effects, and control measures of noise, soil, and radiation pollution and assess their environmental impacts.
CO5	Identify conventional and non-conventional energy sources for domestic and industrial applications and apply suitable waste management practices to address solid and e-waste-related environmental problems.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Multidisciplinary Nature Of Environmental Science And Ecology 1.1 Definition, scope, importance and need for public awareness. 1.2 Ecosystem, basic structure of an ecosystem (abiotic and biotic components), 1.3 Biogeochemical cycles (carbon cycle, oxygen cycle, nitrogen cycle and hydrological cycle), 1.4 Food chain, food web, 1.5 Ecological pyramid. Course Outcome: CO1 Time : 4 hrs
2	Water Pollution And Waste Water Treatment 2.1 Water resources, 2.2 Sources of water pollution, various pollutants, their toxic effect 2.3 Potability of water (Indian standard of drinking water), 2.4 primary and secondary waste water treatment 2.5 Trickling filter & Activated sludge process Course Outcome: CO2 Time : 4 hrs

3	Air Pollution 3.1 Introduction, classification of air pollutants, 3.2 Toxic effects of air pollutants, sources and their control measure 3.3 ESP, catalytic converter, and bag house filter, 3.4 Greenhouse effect, Global warming, 3.5 Ozone depletion. Course Outcome: CO3 Time : 4 hrs
4	A brief introduction to Noise Pollution, Soil Pollution, and radiation pollution 4.1 Noise Pollution (Introduction & sources) 4.2 Effects and control measures of noise pollution 4.3 Soil Pollution (Introduction & sources) 4.4 Effects and control measures of soil pollution 4.5 Radiation pollution Course Outcome: CO4 Time : 4 hrs
5	Renewable sources of Energy & Solid Waste Management 5.1 Solar Energy: Basics of Solar energy. Flat plate collector 5.2 Current status and prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy. 5.3 Solid waste generation- Sources and characteristics of : Municipal solid waste, 5.4 E-waste and biomedical waste 5.5 Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste Course Outcome: CO5 Time : 4 hrs

REFERENCE BOOKS:

S. No.	Title	Author, Publisher, Edition and Year of Publication	ISBN
1	Environmental Chemistry	A. K. De; New Age International Publishers; 7th Edition, 2010	9788122420077
2	A Basic Course in Environmental Studies	Rajesh Deswal & Sunita Deswal; Dhanpat Rai Publications; 2nd Edition, 2017	9789387788773
3	Environmental Pollution Control Engineering	C. S. Rao; New Age International Publishers; 3rd Edition, 2018 (Reprint)	9788122418357
4	Essentials of Ecology and Environmental Science	S. V. S. Rana; Prentice-Hall of India (PHI Learning); 5th Edition, 2017	9788120351571

E-REFERENCES:

1. <http://cgwb.gov.in/Documents/WQ-standards.pdf>
2. <https://www.unep.org>
3. <https://www.epa.gov/environmental-topics>

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

PHYSICS LAB-II

Programme: Diploma In Engineering							
Course Code: DBS26202			Course Title: Physics Lab -II				
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-II is designed to reinforce the theoretical concepts of electricity, optics, and engineering mechanics through hands-on experiments. The course develops practical skills in measurement, observation, data analysis, and interpretation of experimental results. It enables students to understand fundamental physical principles and their engineering applications while fostering scientific inquiry, problem-solving abilities, and laboratory competency essential for engineering studies.

COURSE OUTCOMES

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

CO1	Verify fundamental electrical laws and perform electrical measurements using Ohm's law, multimeter, and galvanometer-based instruments.
CO2	Conduct optics experiments to determine optical parameters and validate fundamental laws of light using prisms and photometric techniques.
CO3	Apply principles of statics to verify the polygon law of forces and law of moments through experimental investigations.
CO4	Analyze engineering mechanics concepts related to beam reactions and friction through laboratory experiments and interpretation of results.
CO5	Perform experiments on simple machines and rotational systems, such as jib crane, screw jack, and flywheel, to evaluate their working principles and mechanical performance.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	1.1 Verification of Ohm's Law. 1.2 Determination of resistance using colour code and multimeter. 1.3 Conversion of galvanometer into ammeter and voltmeter. Course Outcome: CO1 Time : 6 hrs
2	2.1 Determination of angle of minimum deviation using prism. 2.2 Verification of inverse square law for light. Course Outcome: CO2 Time: 4hrs
3	3.1 Polygon law of forces. 3.2 Law of moments. Course Outcome: CO3 Time : 4 hrs
4	4.1 Beam reaction experiment. 4.2 Friction experiment. Course Outcome: CO4 Time : 4 Hrs
5	5.1 Jib crane experiment. 5.2 Screw jack experiment. 5.3 Flywheel experiment. Course Outcome: CO Time : 6 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:

4. <http://hyperphysics.phy-astr.gsu.edu>
5. <https://openstax.org/subjects/science>
6. <https://nptel.ac.in/courses/physics>

CO VS PO MAPPING

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

CHEMISTRY LAB -II

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DBS26204			COURSE TITLE: Chemistry Lab – II				
COMPULSORY / OPTIONAL:							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEEK	CREDIT	PE	FINAL	TOTAL
		2	2	1	60	40	100

RATIONALE: Chemistry Lab-II is designed to provide hands-on experience in chemical analysis techniques relevant to engineering and industrial applications. The course enables students to perform water quality testing, volumetric analysis, lubricant and fuel characterization, and organic compound identification using standard laboratory procedures. It develops practical skills in experimentation, observation, data interpretation, and safe handling of chemicals and laboratory equipment. The laboratory work strengthens the understanding of theoretical concepts and enhances analytical, problem-solving, and technical skills required for engineering practice.

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

CO1	Perform water quality analysis, hardness, alkalinity, and other related chemical parameters using standard laboratory methods.
CO2	Apply volumetric and iodometric titration techniques for quantitative chemical analysis in laboratory and industrial applications.
CO3	Analyse the characteristics of lubricants (viscosity, viscosity index) and coal by determining the moisture content, ash content, volatile matter, and fixed carbon.
CO4	Identify saturated and unsaturated organic compounds and detect functional groups through systematic organic analysis techniques.
CO5	Develop practical skills in qualitative analysis of salt mixtures, safe handling of chemicals and laboratory apparatus, observation skills, and analytical skills required for engineering and industrial practices.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	Water Analysis 1.1 To determine the Carbonate Hardness of a given sample of water. 1.2 To determine the Non Carbonate Hardness of a given sample of water 1.3 To determine the Total Hardness of a given sample of water by EDTA method. 1.4 To determine the hydroxyl , carbonate, and bicarbonate alkalinity separately of the given sample of water. Course Outcome:CO1 Time : 8 hrs
2	Titration related to Iodometric titration 2.1 Estimation of free chlorine using hypo solution Course Outcome:CO2 Time : 2 hrs
3	Lubricant and coal analysis 3.1 To determine the viscosity of heavy oil with the help of Redwood Viscometer. 3.2 To determine moisture, V.C.M, Ash, and Fixed Carbon content in given sample of coal. Course Outcome:CO3 Time : 4 hrs
4	Test for functional group in Organic compounds 4.1 Test for saturated and unsaturated organic compound.

	4.2 To identify the functional group in the given organic compounds. Course Outcome:CO4 Time : 4 hrs
5	Qualitative Analysis. 5.1 Determination of two anions and two cations in a given salt mixture. 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- $(\text{CO}_3)^{2-}$, 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 Outcome:CO5 Time : 8 hrs

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), 2009	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-REFERENCE:

1. <https://chem.libretexts.org>
2. <https://nptel.ac.in/courses>
3. <https://edu.rsc.org>

CO VS PO MAPPING

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	3	2	-	2
CO2	3	2	1	3	1	-	2
CO3	3	3	2	3	2	-	2
CO4	3	2	1	3	1	-	2
CO5	3	3	2	3	2	1	3

BASICS OF ELECTRICAL & ELECTRONICS LAB

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DES26202			COURSE TITLE: BASICS OF ELECTRICAL & ELECTRONICS LAB				
COMPULSORY / OPTIONAL: COMPULSORY							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	END	TOTAL
0	0	2	2	1	60	40	100

RATIONALE: Electrical and electronic engineering work forms the forefront of practical technology, improving the devices and systems we use every day. Hence this lab. course serves as a foundation course to the budding diploma engineers.

COURSE OUTCOMES

CO1	Develop the essential skills for understanding and interpreting DC circuits
CO2	Learn and analyse AC circuits.
CO3	Learn and appreciate the operation and applications of electrical safety systems.
CO4	Acquire necessary ability to distinguish between various semiconductor materials and devices.
CO5	Learn and apply logic gates to realize simple digital operations.

COURSE CONTENT DETAILS:

EXPERIMENT	TOPICS
1	Verification of Ohm's Law Objective: To verify Ohm's Law for a DC circuit. Course Outcome:CO1 Time:2Hrs
2	Study of Resistor, Inductor and Capacitor (R, L, C) Objective: To study the behavior and characteristics of resistor, inductor, and capacitor. Course Outcome:CO1 Time:2Hrs
3	Verification of Kirchhoff's Current Law (KCL) & Kirchhoff's Voltage Law (KVL) Objective: To verify that the KCL & KVL for a given electrical circuit. Course Outcome:CO1 Time:2Hrs
4	Resistor Color Code Objective: (a) To learn Resistor Color Code (b) To determine the stated value of a resistor by interpreting the color code indicated on the resistor. Course Outcome:CO1 Time:2Hrs
5	Study of AC Waveform Generation Objective: To study the generation of alternating voltage using an AC generator/function generator. Course Outcome:CO2, CO3 Time:2Hrs
6	Verification of AC Circuit in R, L and C Components

	Objective: To study voltage-current relationship in resistive, inductive, and capacitive circuits. Course Outcome: CO2, CO3 Time: 2Hrs
7	Determination of Cut-In voltage and plot V-I Characteristics for a given diode Course Outcome: CO4 Time : 2 hrs
8	Identification of Transistors and Study of transistors using Data Sheets Course Outcome: CO4 Time : 2 hrs
9	Verification of Basic gates, Universal and Special gates. Course Outcome: CO5 Time : 2 hrs
10	Construction of Basic gates using Universal gates Course Outcome: CO5 Time: 2Hrs

REFERENCE BOOKS:

S. No.	Title	Author, Publisher, Edition and Year of Publication	ISBN
1	Basics of Electrical, Electronics and Communication Engineering	K. A. Navas & T. A. Suhail; Rajath Publishers, Kochi; 1st Edition, 2010	9788192189437 (Google Books)
2	Fundamental Electrical and Electronic Principles (Third Edition)	Christopher R. Robertson; Newnes (Elsevier); 3rd Edition, 2008	9780750687379 (Amazon India)
3	Basic Electronics and Linear Circuits	N. N. Bhargava, D. C. Kulshreshtha & S. C. Gupta; Tata McGraw-Hill (TTTI Chandigarh Series); Revised Edition	9780074634489
4	Electronic Devices & Components	Allen Mottershead; Prentice Hall of India (PHI); Revised Edition	9788120310417

E-REFERENCES:

1. www.circuitglobe.com
2. www.courses.lumenlearning.com
3. www.allaboutcircuits.com

CO Vs PO MAPPING:

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

WORKSHOP PRACTICE

PROGRAMME: DIPLOMA IN ENGINEERING							
COURSE CODE: DES26204			COURSE TITLE: Workshop Practice				
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

COURSE OBJECTIVES: This course enables the students to

1.	Familiarize with the basics of manufacturing processes.
2.	Impart knowledge and skill to use tools, machines, equipment, and measuring instruments
3.	Practice on manufacturing of components using workshop trades
4.	Educate students on the safe handling of machines and tools.
5.	Exercise individual as well as group activity with hands-on training in different workshop trades.

COURSE OUT COMES:

CO 1	Learn to identify and specify hand tools and machinery used in different shops according to job.
CO 2	Understand job drawing and selection of raw materials related to different manufacturing processes.
CO 3	Able to complete jobs as per specifications given in the drawing in the allotted time.
CO 4	Learn to operate and control different machines and equipment's with all safety precautions.
CO 5	Inspect the job for the desired quality and dimensions.

COURSE CONTENT:

Sl. No.	Details of Practical Content
1.	Title : Carpentry: 1.1 Demonstration of different types of wood. 1.2 Wood working tools/machines. 1.3 Demonstration of different wood working processes like planing, marking, grooving etc. 1.4 One simple job using different tools of carpentry shop. Course Outcomes:CO1, CO2, CO3 , CO5 Teaching / Time:12 hours
2.	Title:Fitting: 2.1 Demonstration of different fitting tools and drilling machines. 2.2 Demonstration of different fitting operations like chipping,filing,drilling,tapping etc. 2.3 One simple fitting job involving practice of fitting operations. Course Outcomes:CO1, CO2, CO3 , CO5 Teaching / Time:9 hours
3.	Title : Welding: 3.1 Identification of different welding tool and machines 3.2 Demonstration of different welding methods 3.3 One simple job involving butt and lap joint. Course Outcomes:CO1, CO2, CO3 ,CO4 Teaching / Time:9 hours

4.	Title: Sheet Metal: 4.1 Demonstration of different sheet metal tools/ machines. 4.2 Demonstration of different sheet metal operations like cutting , bending, soldering ,brazing etc. 4.3 one simple job involving sheet metal operations, soldering and riveting. Course Outcomes:CO1, CO2, CO3, CO5 Teaching / Time:9 hours
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TEXT BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of Publication	ISBN
1	Elements of Workshop Technology, Vol. I	S. K. Hajra Choudhury, A. K. Hajra Choudhury & Nirjhar Roy, Media Promoters & Publishers Pvt. Ltd., Latest Edition	9788189928228
2	Elements of Workshop Technology, Vol. II	S. K. Hajra Choudhury, A. K. Hajra Choudhury & Nirjhar Roy, Media Promoters & Publishers Pvt. Ltd., Latest Edition	9788189928235
3	A Course in Workshop Technology	B. S. Raghuwanshi, Dhanpat Rai Publications, Latest Edition	9788187433786
4	Manufacturing Technology (Vol. I & II)	P. N. Rao, Tata McGraw-Hill Education, Latest Edition	9781259062570
5	Manufacturing Engineering and Technology	Serope Kalpakjian & Steven R. Schmid, Pearson Education, 7th Edition	9780133128746

E-REFERENCES:

2. <https://nptel.ac.in/courses/112>
3. <https://ocw.mit.edu>
4. <https://ocw.mit.edu>

CO Vs PO MAPPING:

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

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: DHS26202			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 - Meaning, Definition, Aims and Objectives of Physical Education. - Changing Trends in Physical Education. - Ancient and Modern Olympic Games (Summer and Winter Olympics). - Olympic Symbols, Ideals, Objectives and Values. - 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 Meaning and Importance of Physical Fitness and Wellness.

	7. Components of Physical Fitness. 8. Components of Health-Related Fitness. 9. Dimensions and Components of Wellness. 10. 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 6. Introduction to Anatomy and Physiology. 7. Importance of Anatomy and Physiology in Physical Education, Sports and Yoga. 8. Structure and Functions of Major Body Systems. 9. Effects of Exercise on the Circulatory System. 10. Effects of Exercise on the Respiratory and Neuromuscular Systems. Course Outcome: CO3 Teaching/ Practice Hours:4hrs
4	Kinesiology, Biomechanics and Posture 8. Meaning and Importance of Kinesiology and Biomechanics in Sports. 9. Newton's Laws of Motion and their Applications in Sports Activities. 10. Friction and its Effects in Sports Performance. 11. Meaning, Concept and Importance of Correct Posture. 12. Common Postural Deformities: Knock Knee, Flat Foot, Round Shoulders, Lordosis, Kyphosis, Bow Legs and Scoliosis. 13. Corrective Measures for Postural Deformities. 14. Advantages and Limitations of Weight Training. Course Outcome: CO4 Teaching/ Practice Hours:4hrs
5	Yoga Practices and Sports Activities 7. Introduction to Yoga and its Importance for Health and Fitness. 8. Basic Yogic Practices: Asanas, Pranayama and Relaxation Techniques. 9. Physical Conditioning through Yoga and Sports Activities. 10. Participation in Individual and Team Sports. 11. Recreational and Competitive Sports Activities. 12. 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 Fissette; 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:

2. <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