School of Engineering and Technology

Diploma

Programme Structure & Syllabus

Civil Engineering

2023-24

K.K. University

Bihar Sharif, Nalanda - 803115

Contents

PREFACE

The vision of the K. K. University, Bihar Sharif, Nalanda, the first private university in the state of Bihar, established in 2017, is to ensure excellence in higher education. As highlighted by Shri (Er.) Ravi Chaudhary, the Hon'ble Chancellor of K. K. University, the technical education is the key to the socio – economic development in the current era of knowledge based economy of the country. In this reference, the K. K. University, Bihar Sharif has accepted the responsibility of providing modern engineering education in all branches of relevance to the state of Bihar and India using scientifically planned syllabi which is suitable for faster economic development and is industry relevant, innovation oriented and which promotes the entrepreneurship in its students.

In view of these guidelines and as per the present needs of a upgraded modern syllabus in all branches of engineering, Diploma degrees of which are offered by K.K. University, a scientifically engineered new syllabus has been prepared by young and dynamic team of teachers of this university which is presented in this document. A multi and inter disciplinary approach has been taken in preparation of syllabus to provide a complete package of in-depth theoretical as well as practical knowledge in all branches of engineering in which Diploma degrees are offered by this university.

I am sure that this document, describing all relevant information branch wise at one place will be extremely useful to all stakeholders including teachers and students to have a broad and focused knowledge of K.K. University's sincere efforts in development of quality human recourses in engineering disciplines. I express my gratitude to Hon'ble Chancellor, Er. Ravi Chaudhary and Hon'ble Pro-Chancellor, Er. Richee Ravi, Hon'ble Vice-Chancellor, Prof. (Dr.) B. Narayana, Hon'ble Pro-Vice-Chancellor, Prof. (Dr.) Rumki Bandyopadhyay for their extremely useful suggestions and guidance in preparation of this document. I also express my sincere thanks to all Head of Departments and teachers of K.K. University for their hard work and sincere efforts in shaping the present document. Efforts of Kumar Vikram of Mechanical Engineering, Kriti Raj of Electrical Engineering and Ramsevak Sharma of Civil Engineering Departments are sincerely acknowledged and appreciated from inner core of my heart. I also appreciate the hard work put in by Shri Gopal Kumar, IT Officer of the university in final printing of the documents of all branches of Engineering.

Dr. Jitendra Kumar,
(Principal)
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CIVIL ENGINEERING (DIPLOMA)

PROGRAM OUTCOMES (PO'S)

Program Outcomes (POs):- Based on Program Educational Objectives (PEOs) of Civil Engg. Department,Students will be able to

PO1	Apply knowledge of mathematics, science, and engineering fundamentals to solve complex civil engineering problems.
PO2	Identify, formulate, and analyze civil engineering problems using principles of mathematics, natural sciences, and engineering sciences.
PO3	Design safe, sustainable, and cost-effective civil engineering solutions, considering public health, safety, societal, and environmental needs.
PO4	Use research-based knowledge and methodologies, including data analysis, experiments, and interpretation, to provide solutions to civil engineering problems.
PO5	Create, select, and apply modern engineering tools, techniques, and software to analyze and solve civil engineering tasks, with an understanding of their limitations.
PO6	Assess societal, health, safety, legal, and cultural issues, and demonstrate responsibility relevant to professional civil engineering practice.
PO7	Apply ethical principles and commit to professional ethics, responsibilities, and norms of civil engineering practice.
PO8	Function effectively as an individual, as a member of a diverse team, or as a leader in multidisciplinary projects.
PO9	Communicate effectively about civil engineering activities with professionals, the community, and other stakeholders through clear reports, documentation, presentations, and instructions.
PO10	Demonstrate knowledge and understanding of engineering and management principles to lead and manage projects in multidisciplinary environments.
PO11	Recognize the need for lifelong learning to keep pace with technological advancements and changing societal needs.

PROGRAM SPECIFIC OUTCOMES (PSO'S)

PSO1	The students of Civil Engineering are capable of applying the knowledge of mathematics and sciences in modern power industry.
PSO2	Diploma students will be able to apply basic knowledge of civil engineering principles to carry out planning, surveying, drafting, and estimation for small to medium-scale civil engineering projects.
PSO3	Diploma students will demonstrate the ability to supervise, manage, and execute construction and maintenance activities for residential, commercial, and public infrastructure projects.
PSO4	Practice professional ethics and work in a team and communicate to keep abreast of latest developments to achieve project objectives for the betterment of the society.

Semester-wise Detailed Engineering

Diploma in Electrical Engineering

Semester-I

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PAS1101	Basic Physics	5	0	0	5
2	PAS1102	Basic Chemistry	3	1	0	4
3	PAS1103	Basic Mathematics	3	1	0	4
4	PAS1104	Communication Skill-I	3	1	0	4
5	PME1101	Engg. Graphics	3	1	0	4
6	PAS1105	Computer Fundamentals	3	1	0	4

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
7	PAS1101P	Basic Physics Lab.	0	0	3	2
8	PAS1102P	Basic Chemistry Lab	0	0	2	1
9	PAS1105P	Computer Fundamental	0	0	2	1
10	PME1102P	Basic Workshop Practice	0	0	2	1
Total						**30**

Semester-II

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PAS1201	Communication Skills-II	3	1	0	4
2	PAS1202	Engg. Mathematics	4	1	0	5
3	PAS1203	Applied Science	3	1	0	4
4	PME1201	Engg. Mechanics	3	1	0	4
5	PME1202	Engg. Drawing	4	1	0	5

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
6	PAS1201P	Communication Skills (Language Lab)	0	0	2	1
7	PAS1203P	Applied Science	0	0	2	1
8	PME1201P	Engineering Mechanics	0	0	2	1
9	PME1203P	Workshop Practice	0	0	3	2
Total						**27**

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SEMESTER-III
THEORY

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	P1M2101	Applied Mathematics	5	0	0	5
2	PCE2101	Surveying	3	1	0	4
3	PCE2102	Building Construction	3	1	0	4
4	PCE2103	Building Drawing	4	0	0	4
5	PCE2104	Concrete Technology	3	1	0	4

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
6	PCE2101P	Surveying Lab	0	0	2	1
7	PCE2102P	Building Construction Lab	0	0	2	1
8	PCE2103S	Building Drawing Lab	0	0	3	2
9	PCE2104P	Concrete Technology Lab	0	0	3	2
					Total	28

SEMESTER-IV
THEORY

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PCE2201	Advance Surveying	3	1	0	4
2	PCE2202	Mechanics of Structures	3	1	0	4
3	PCE2203	Soil Mechanics	3	1	0	4
4	PCE2204	Transportation Engineering	4	0	0	4
5	PCE2205	Hydraulics	3	1	0	4

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
6	PCE2201P	Advance Surveying Lab	0	0	4	2
7	PCE2202P	Mechanics of Structures Lab	0	0	3	2
8	PCE2203P	Soil mechanics Lab	0	0	3	2
9	PCE2205P	Hydraulics Lab	0	0	4	2
					Total	28

SEMESTER-V

THEORY

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PCE3101	Theory of Structure	5	0	0	5
2	PCE3102	Design of Steel Structure	4	1	0	5
3	PCE3103	Estimating and Costing	4	0	0	4
4	PCE3104	Highway Engineering	3	1	0	4
5	PCE3105	Irrigation Engineering	4	1	0	5

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
6	PCE3101P	Theory of Structure Lab	0	0	2	1
7	PCE3102P	Design of Steel Structure Lab	0	0	2	1
8	PCE3104P	Highway Engineering Lab	0	0	3	2
9	PCE3105P	Irrigation Engineering Lab	0	0	2	1
10	PCE3106S	In Plant Training & Visit to Work	0	0	4	2
				Total		30

SEMESTER-VI

THEORY

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PSH3201	Management (Common)	5	0	0	5
2	PCE3201	Contracts and Accounts	4	0	0	4
3	PCE3202	Environment Engineering	4	1	0	5
4	PCE3203	Design of Structures	4	1	0	5
5	PCE3204	Elective - (Any one)	3	1	0	4
(i) Advanced Construction Techniques and Equipment's (PCE3204A)		(ii) Maintenance and Rehabilitation of Structures (PCE3204B)		(iii) Architectural practices and Interior Design (PCE3204C)		

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PCE3202P	Environment Engineering Lab	0	0	2	1
2	PCE3203S	Design of Structures Lab	0	0	2	1
3	PCE3204P	Elective - (Any one)	0	0	2	1
(i) Advanced Construction Techniques and Equipment's Lab (PCE3204PA)		(ii) Maintenance and Rehabilitation of Structures Lab (PCE3204PB)		(iii) Architectural practices and Interior Design Lab (PCE3204PC)		
4	PCE3205S	Civil Engineering Project	0	0	4	2
				Total		28

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Basic Physics

Subject Code	Theory			Credits
PAS1101	No. of Period Per Week			
	L	T	P	
	5	0	0	5
	-	-	-	

Course Objectives:

- Basic Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave.

- Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

- The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology based applications.

Contents: Theory

Unit	Name of the topic	Hours
01	**UNITS AND MEASUREMENTS** 1.1 Need of Measurement in engineering and science, unit of a physical quantity, requirements of standard unit, systems of units-CGS, MKS and SI, classification of physical quantities Fundamental and Derived with their units. 1.2 Accuracy, Precision of instruments, Errors in measurement, Estimation of errors Absolute error, Relative error and percentage error, significant figures. (Simple Problems). 1.3 Basic Measuring instruments - Vernier Caliper, Micrometer screw gauge, inner & outer caliper thermometer, speedometer, ammeter, voltmeter with their least count, range, accuracy and precision. Standard reference surfaces used in engineering measurements surface plate, angle plate, V- block, Engineer's square.	3

02	**GENERAL PROPERTIES OF MATTER** 2.1 Elasticity : Deforming force, Restoring force, Elastic and plastic body, Stress and strain with their types, Hooke's law, Stress strain diagram, Young's modulus, Bulk modulus, Modulus of rigidity and relation between them(no derivation), (simple problems). (Simple problems). Stress strain diagrams of H.T. Steel, Cast iron, Aluminum and Concrete, Ultimate and breaking stress, Factor of safety. 2.2 Surface Tension: Forces—cohesive and adhesive, angle of contact, shape of liquid surface in a capillary tube, capillary action with examples, relation between surface tension , capillary rise and radius of capillary (no derivation), (simple problem), effect of impurity and temperature on surface tension. 2.3 Viscosity : Velocity gradient, Newton's law of viscosity, coefficient of viscosity, streamline and turbulent flow, critical velocity, Reynold's number, (simple problems), Stokes law and terminal velocity (no derivation), buoyant (up thrust) force, effect of temperature & adulteration on viscosity of liquid.	**7**

03	**HEAT** 3.1 Transmission of heat and expansion of solids: Three modes of transmission of heat - conduction, convection and radiation, good and bad conductor of heat with examples, law of thermal conductivity, coefficient of thermal conductivity (simple problems), expansion of solids-linear, aerial and cubical and relation between them. 3.2 Gas laws and specific heats of gases: Boyle's law, Charles's law, Gay Lussac's law, absolute temperature, Kelvin scale of temperature, general gas equation(no derivation) (simple problems), molar or universal gas constant, universal gas equation, standard or normal temperature and pressure (N.T.P.), specific heat of gases, relation between two specific heat (simple problems), thermodynamic variables, first law of thermodynamics (statement & equation only), isothermal, isobaric, isochoric & adiabatic processes (difference among these processes and equations of state).	**6**
04	LIGHT 3.1 Properties of light: Reflection and refraction, Snell's law, physical significance of refractive index (simple problems), Total internal reflection, dispersion, diffraction and polarization of light (only introduction). 3.2 Wave theory of light & Interference: Newton's corpuscles theory of light, Huygens's wave theory, wave front, Types of wave front-spherical, cylindrical and plane Huygens's principle of propagation of wave front, Principle of superposition of waves, Interference of light, constructive and destructive interference, Young's experiment. Analytical treatment of interference, conditions for stationary interference pattern. 3.3 Laser: Light amplification by stimulated emission of radiation, properties of laser, spontaneous and stimulated emission, population inversion, pumping methods, He-Ne laser construction & working, recording and reconstructing of hologram by using He- Ne laser.	**11**

05	MODERN PHYSICS 4.1 Photo electricity : Plank's hypothesis, properties of photons, photo electric effect, laws and characteristics of photoelectric effect, Einstein's photoelectric equation,(simple problems), construction and working of photoelectric cell, applications of photoelectric cell. 4.2 X-rays : Production of X-rays, types of X-ray spectra-continuous and characteristics, X-ray wavelength (simple problems), properties of X-rays, applications of X-rays-engineering, medicine and scientific research work.4.3 Series expansions of even and odd functions.		**6**
	TOTAL		**33**

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Physics–I	V. Rajendran	Tata McGraw-Hill raw-Hill publication, New Delhi
Applied Physics	Arthur Beiser.	Tata McGraw-Hill raw-Hill publication, New Delhi
Engineering. Physics	R.K. Gaur & S.L. Gupta. Dhanpat Rai	Dhanpat Rai Publication, New Delhi.
Physic	Resnick and Halliday	
Concept of Physics Part-I & II	H.C. Verma	
Basic Physics	Roshan Kr. Sinha	Foundation Publishing House

Course outcomes:

At the end of the course, the student will be able to:

- Familiarize and analyze the signal accordance accuracy, precision, sensitivity, resolution, errors etc.
- Identify and describe properties of matter Solid, liquid and gas, including: flexibility, strength, transparency, hardness, water resistance, size, color, weight and texture.
- Understand the basic laws of heat transfer and Distinguish between conduction, convection and radiation; identify different methods for reducing heat losses and mode of heat transfer between bodies at different temperatures.
- Apply the knowledge of light related event, illustrate the conditions for light amplification in various LASER and laser based instruments and optical devices.
- Apply the knowledge photo electric effect and x-ray, application of x- ray.

Basic Chemistry

Subject Code	Theory			Credits
PAS1102	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:

- To acquire knowledge about desalination of brackish water and treatment of municipal water.
- To gain the knowledge of conducting polymers, bio-degradable polymers and fiber reinforced plastics.
- To learn significance of green chemistry and green synthesis and the synthesis of nano materials.
- To understand mechanism of corrosion and preventive methods.
- To understand concept of semi conductivity, superconductivity and liquid crystal and solar energy.

Contents: Theory

Unit	Name Of The Topic	Hours
01	**Atomic Structure :** Definition of Atom, Fundamental Particles of Atom –their Mass, Charge, Location, Definition of Atomic no, Atomic Mass no. Isotopes & Isobars, & their distinction with suitable examples, Bohr's Theory, Definition, Shape & Distinction between Orbits & Orbitals, Hund's Rule, Filling Up of the Orbitals by Aufbau's Principles (till Atomic no.30), Pauli's exclusion principle, Valency – Definition, types (Electrovalency & Covalency), Distinction, Octet Rule, Duplet Rule, Formation of Electrovalent & Covalent Compounds e.g. Nacl, CaCl2, MgO, AlCl3, CO2, H2O,Cl2, NH3, C2H4, N2,C2H2.	5

02	**Electrochemistry :** Definition Ionisation & Electrolytic Dissociation, Arrhenius Theory of Ionisation, Significance of the Terms Involved in Electrolysis. Such as Conductors, Insulators or Dielectrics, Electrolyte, Non Electrolyte, Electrolysis, Electrolytic Cell, Electrodes, Current Density, Temperature, Mechanism of Electrolysis – Primary & Secondary Reactions at Cathode & Anode, Electrochemical Series for Cations & Anions, Electrolysis of $CuSO_4$ Solution by using Cu Electrode & Platinum Electrode, Electrolysis of NaOH solution & fused NaCl, Faraday's first & second law of Electrolysis & Numericals, Electrochemical Cells & Batteries, Definition, Types (Primary & Secondary Cells), e.g. Construction, Working & Applications of Dry Cell / Laclanche Cell & Lead – Acid Storage Cell, Applications of Electrolys such as Electroplating & Electro refining, Electrometallurgy & electrotyping Conductivity of Electrolyte – Ohms Law, Definition & Units of Specific Conductivity, Equivalent Conductivity, specific resistance.	6

03	**Metals & Alloys Metals :** Occurrence of Metals, Definition Metallurgy, Mineral, Ore, Gangue, Flux & Slag, Mechanical Properties, Processing of Ore, Stages of Extraction of Metals from its Ores in Detail i.e. Concentration, Reduction, refining. Physical Properties & Applications of some commonly used metals such as Fe, Cu, Al, Cr, Ni, Sn, Pb, Zn, Co, Ag, W. Alloys: Definition of Alloy, Purposes of Making alloy Preparation Methods, Classification of Alloys such as Ferrous & Non Ferrous, examples. Composition, Properties & Applications of Alnico, Duralumin, Dutch Metal, German Silver / Nickel Silver, Gun Metal, Monel metal, Wood's Metal, Babbitt Metal.	8
04	**Non Metallic Materials Plastics :** Definition of Plastic, Formation of Plastic by Addition & Condensation Polymerization by giving e.g. of Polyethylene & Bakelite plastic Respectively, Types of Plastic, Thermo softening & Thermosetting Plastic, with Definition, Distinction & e.g., Compounding of Plastics – Resins, Fillers, Plasticizers, Acceleraters, Pigments, Engineering Applications of Plastic based on their Properties. Rubber: Natural Rubber: Its Processing, Drawbacks of Natural Rubber, Vulcanisation of Rubber with Chemical Reaction. Synthetic Rubber: Definition, & e.g., Distinction Between Natural & Synthetic Rubber. Thermal Insulating Materials : Definition, Characteristics & Applications of Glass, Wool, Thermocole, Asbestos, Cork.	4

05	**Environmental Effects (Awareness Level) :** Introduction, Definition, Causes of Pollution, Types of Pollution, Such as Air & Water Pollution. Air Pollution : Definition, Types of Air Pollutions their Sources & Effects, Such as Gases, Particulates, Deforestation, Radio Active Gases, Control of Air Pollution, Air Pollution Due to Internal Combustion Engine & Its Control Methods, Causes & Effects of Ozone Depletion & Green House Effects. Water Pollution : Definition, Causes & Methods of Preventing Water Pollution, Types of Waste such as Domestic Waste, Industrial Waste, their Physical & Biological Characteristics, BOD,COD, Biomedical Waste & E–Waste, their Origin, Effects & Control Measures. Preventive Environmental Management (PEM) Activities.	9
TOTAL		**32**

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons
Engineering Chemistry	S.S. Dara	S. Chand Publication
Industrial Chemistry	B.K. Sharma	Goel Publication
Environmental Chemistry &Pollution Control.	S.S. Dara	S. Chand Publication
Basic Chemistry	Sanjay Kumar, Rahul Kumar	Foundation Publishing House

Course outcomes:

At the end of the course, the student will be able to:

- Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.
- Substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
- Design economically and new methods of synthesis Nano materials.
- Apply their knowledge for protection of different metals from corrosion.
- Have the knowledge of converting solar energy into most needy electrical energy efficiently andeconomically to reduce the environmental pollution.

Basic Mathematics

Subject Code	Theory			Credits
PAS1103	**No. of Period Per Week**			
	L	**T**	**P**	
	3	**1**	**0**	**4**
	-	-	-	

Course Objectives:

The course is aimed to develop the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studiesin many fields of engineering and technology.

- Matrices –To provide detailed of matrices which is applied for solving system of linear equations and usefulin various fields of technology.
- Partial Derivatives – This course enables to provide an overview of partial derivatives and its applications which is used for solving optimization problems and concepts is needed in study of wave, heat equation of various orders and also in calculation of errors in various engineering subjects.
- Complex numbers – This course enables the students to learn the concept of imaginary numbers and gives awareness about algebra of complex numbers which helps in understanding of engineering subjects like electrical circuits, Electromagnetic wave theory, and complex analysis etc.
- Indeterminate forms and Taylor series- It helps the students to understand and apply the concept of existence of limits, indeterminate conditions, expansion of standard and non-standard functions in seriesform.
- Successive Differentiation – To provide understanding of existence of nth order derivative.
- Numerical methods and scilab: To build ability to solve numerically system of linear equations, algebraic and transcendental equations. To provide an overview of the experimental aspect of applied mathematics.

Contents: Theory

Unit	Name of the topic	Hour
1	**Algebra** **1.1 Revision:** 1.1.1 Laws of Indices 1.1.2 Formula of factorization and expansion ((a_2-b_2), (a_2+b_2) etc.) Laws of logarithm with definition of Natural and Common logarithm.	**1**
	1.2 Partial fraction: 1.2.1 Definition of polynomial fraction proper & improper fractions and definition of partial fractions. 1.2.2 To resolve proper fraction into partial fraction with denominator containing non repeated linear factors, repeated linear factors and irreducible non repeated quadratic factors. 1.2.3 To resolve improper fraction into partial fraction.	**4**

	1.3 Determinant and Matrices: **Determinant** 1.3.1 Definitionandexpansionofdeterminantsoforder2and3. 1.3.2 Cramer'sruletosolvesimultaneousequationsin2and3unknowns. **Matrices** 1.3.3 Definition of a matrix of order m x n types of matrices. 1.3.4 Algebra of matrices such as equality, addition, Subtraction, scalar multiplication and multiplication. 1.3.5 Transpose of a matrix. 1.3.6 Minor, cofactor of an element of a matrix, adjoint of matrix and inverse of matrix by adjoint method. 1.3.7 Solutionofsimultaneousequationscontaining2and3unknownsbymatrixinversionmethod.	12
	1.4 Binomial Theorem: 1.4.1 Definition of factorial notation, definition of permutation and combinations with formula. 1.4.2 Binomial theorem for positive index. 1.4.3 General term. 1.4.4 Binomial theorem for negative index. 1.4.5 Approximate value (only formula)	4
2	**Trigonometry.** **2.1 Revision:** 2.1.1 Measurement of an angle(degree and radian).Relation Between degree and radian. 2.1.2 Trigonometric ratios of 00,300,450etc. 2.1.3 Fundamental identities.	2
	2.2 Trigonometric ratios of allied, compound, multiple & Submultiple angles (Questions based on numerical computations, which can also be done by calculators, need not be asked particularly for allied angles).	8
	2.3Factorization and de factorization formulae:	4
	2.4 Inverse Trigonometric ratios: 2.4.1 Definition of inverse trigonometric ratios, Principal values of Inverse trigonometric ratios. 2.4.2 Relation between inverse trigonometric ratios.	2
	2.5 Properties of Triangle 2.5.1 Sine, Cosine, Projection and tangent rules (without proof) 2.5.2 Simple problems.	2
3	**Coordinate geometry** **3.1 Point and distances:** 3.1.1 Distance formula, Section formula, midpoint, centroid of triangle. 3.1.2 Area of triangle and condition of collinearity.	4

	3.2 Straight line: 3.2.1 Slope and intercept of straight line. 3.2.2 Equation of straight line in slope point form, slope-intercept form, two-point form, two- Intercept form, normal form. General equation of line. 3.2.3 Angle between two straight lines condition of parallel and perpendicular lines. 3.2.4 Intersection of two lines. 3.2.5 Lengthofperpendicularfromapointonthelineandperpendiculardistancebetweenparallellines.	**12**
	3.3 Circle : 3.3.1 Equation of circle in standard form, centre – radius form,diameter form, two – intercept form. General equation of circle, its centre and radius.	
4	**Vectors** 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.	**4**
	4.4 Applications 4.4.1 Work done and moment of force about a point & line.	**4**
	TOTAL	**63**

Suggested List of Assignments/Tutorial :	
S. No	**Topic on which tutorial is to be conducted**
1	Partial fractions
2	Determinants
3	Matrices
4	Solution of simultaneous equation by Matrix inversion method.
5	Binomial theorem
6	Trigonometry- fundamental identities-revision only
7	Trigonometry-allied, compound and multiple angles
8	Trigonometry-factorization and de factorization formulae.
9	Trigonometry-inverse trigonometric ratios.
10	Point and distances
11	Straight line
12	Circle.
13	Vectors
14	Vectors' applications

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Mathematics for Polytechnic	S.P. Deshpande	Pune Vidyarthi Griha
Trigonometry	S.L. Lonely	S. Chand Publication
Higher Algebra	H.S. Hall & S.R. Knight	Metric edition, Book Palace, New Delhi
College Algebra	Frc. G. Valles	Charotar Publication
Matrices	Aryes.	Schuam series, McGraw Hill
Higher Engineering Mathematics	B.S. Grewal	Khanna Publications New Delhi
Engineering Mathematics	S.S. Sastry	Prentice Hall of India
Basic Mathematics	Sindhu Prasad	Foundation Publishing House

Course outcomes:

At the end of the course, the student will be able to:

- Apply the knowledge of matrices to solve the problems.
- Know and to understand various types of numerical methods
- Ability to interpret the mathematical results in physical or practical terms for complex numbers
- Inculcate the Habit of Mathematical Thinking through Indeterminate forms and Taylor series expansion
- Solve and analyze the Partial derivatives and its application in related field of engineering.

Communication Skill-I

Subject Code	Theory			Credits
PAS1104	**No. of Period Per Week**			
	L	**T**	**P**	**4**
	3	**1**	**0**	
	-	-	-	

Course Objectives:

Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus, the main objectives of this course are:

- To develop confidence in speaking English with correct pronunciation;
- To develop communication skills of the students i.e. listening, speaking, reading and writing skills;
- To introduce the need for personality development.
- Focus will be on developing certain qualities which will aid students in handling personal and careerchallenges, leadership skills etc.

Contents: Theory

Unit	Name of the topic	Hours
01	**Part I: Text :** Vocabulary - Understanding meaning of new words from text • Comprehension – Responding to the questions from text • Identifying parts of speech	10
02	**PART II -Application of grammar :** Verb Tenses Do as directed (Active /Passive, Direct/Indirect, Affirmative/Negative/Assertive, Question tag, Remove too, Use ofArticle, Preposition, Conjunctions, Interjections, Punctuation)	6
03	**PART III - Paragraph writing :** Definition – Types of paragraphs How to write a paragraph	2
04	**PART IV - Vocabulary building :-** • Word formation • Technical jargon • Use of Synonyms /Antonyms/Homonyms/Paronyms •One word substitute	4
	TOTAL	22

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खंड fgUnh		HOURS
1	शब्द रचना उत्पत्ति एवं विकास व्युत्पत्ति एवं नए शब्दों का निर्माण अनेक शब्दों के लिए एक शब्द, विदेशी भाषा के शब्दों का हिंदी में प्रयोग, देशज एवं विदेशी शब्द, सर्वनामात्मक शब्द विपरीतार्थक शब्द, युग्म शब्द, संक्षेपन, वाक्य:- प्रकार रूपांतरण, अशुद्ध वाक्यों को शुद्ध करना, हिंदी में प्रयुक्त विराम चिन्ह एवं उनका प्रयोग	3
2	व्याकरण के नियमों का ज्ञान एवं उनका प्रयोग	2
3	अनुच्छेद एवं गद्यांश 1 अनुच्छेद लेखन 2 अपठित गद्यांश एवं प्रश्न उत्तर	2
4	आपचाररक पत्र लेखन:- 1 कार्यालय-पत्र 2 प्रेस सूचना 3 प्रेस विज्ञप्ति 4 प्रतिवेदन 5 व्यावसायिक-पत्र 6 लेखन नौकरी के लिए आवेदन-पत्र 7 बायोडाटा	4
5	fØ;kRed@O;kogkfjd :- 1- शब्दों sa dk Lgh mPpkj.k 2- ekSf[kd laisek.k@oDrwrk 'kSyh dk fodkl 3- leqfpr 'kkjhfjd Hkkekk dk i;ksx 4- laokn dk'ky	3
	dk;Z Hkkj ([Assignments] :- 1- शब्द ,oa mudk LkFkd i;ksx 2- dk;ky;h शब्द 3- okD;ka a dh v'kf);k 4- fojke fpg·uka dk i;ksx 5- laokn ys[ku – fLFkfr ds vuqlkj 6- vuqPNsn ys[ku 7- lekpkj i=] fjiksVZ ys[ku 8- शब्दkoyh	
कुल		14

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Contemporary English	David Green	Macmillan
English Grammar andComposition	R.C. Jain	Macmillan
Thesaurus	Rodgers	Oriental Longman
Dictionary	Oxford	Oxford University
English for Practical Purposes	Z.N. Patil	Macmillan
English at Workplace	Editor Mukti Sanyal	Macmillan
Communication Skill-I	Kajari Guha	Foundation Publishing House
English Grammar Just for you	Rajeevan Karal	Oxford Univ. Press
A Practical Guide to EnglishGramma	Dr. K.P. Thakur	Bharti Bhawan

Course outcomes:

At the end of the course, the student will be able to:

- Develop basic speaking and writing skills including proper usage of language and vocabulary sothat they can become highly confident and skilled speakers and writers.
- Be informed of the latest trends in basic verbal activities such as presentations, facing interviews andother forms of oral communication.
- Also develop skills of group presentation and communication in team.
- Develop non-verbal communication such as proper use of body language and gestures.
- Students will heighten their awareness of correct usage of English grammar in writing and speaking.
- Students will improve their speaking ability in English both in terms of fluency and comprehensibility.
- Students will give oral presentations and receive feedback on their performance.
- Students will increase their reading speed and comprehension of academic article.
- Students will improve their reading fluency skills through extensive reading.
- Students will enlarge their vocabulary by keeping a vocabulary journal.
- Students will strengthen their ability to write academic papers, essays and summaries using theprocess approach.

Engineering Graphics

Subject Code	Theory			Credits
PME1101	No. of Period Per Week			
	L	T	P	
	3	1	0	4
	-	-	-	

Course Objectives: Get acquainted with the knowledge of various lines, geometrical constructions and constructionof various kinds of scales, and Ellipse. Improve their imagination skills by gaining knowledge about points, lines andplanes.

Contents: Theory

UNIT	Name of the topic	Hours
01	**Drawing Instruments and their uses :** 1.1 Letters and numbers (single stroke vertical) 1.2 Convention of lines and their applications. 1.3 Scale (reduced, enlarged & full size) plain scale and diagonal scale. 1.4 Sheet layout . 1.5 Introduction to CAD (Basic draw and modify Command). 1.6 Geometrical constructions.	5
02	**Engineering curves & Loci of Point:** 1.2 **To draw an ellipse by :** 2.1.1 Directrix and focus method 2.1.2 Arcs of circle method. 2.1.3 Concentric circles method. **2.2 To draw a parabola by :** 2.2.1 Directrix and focus method 2.2.2 Rectangle method **2.3 To draw a hyperbola by :** 2.3.1 Directrix and focus method 2.3.2 Passing through given points with reference toasymptotes. 2.3.3 Transverse Axis and focus method. **2.4 To draw involutes of circle & polygon (up to hexagon) :** **2.5** To draw a cycloid, 21 picycloids, hypocycloid **2.6** To draw Helix & spiral. **2.7** Loci of Points: **2.4** Loci of points with given conditions and examples related to simple mechanisms.	9

03	**Orthographic projections :** 3.1 Introduction to Orthographic projections. 3.2 Conversion of pictorial view into Orthographic Views (First Angle ProjectionMethod Only). 3.3 Dimensioning technique as per SP-46.	6
04	**Isometric projection :** 4.1 Isometric scale. 4.2 Conversion of orthographic views into isometric View/projection (Simpleobjects) 4.3 Projection of Straight Lines and Planes. (First Angle Projection Method only).	5
05	5.1 Lines inclined to one reference plane only and limited to both ends in onequadrant. 5.2 Projection of simple planes of circular, square, rectangular, rhombus, pentagonal, and hexagonal, inclined to one reference plane and perpendicular to the other.	7
	TOTAL	**32**

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Engineering Drawing	N.D. Bhatta	Charotar Publishing House
Engineering Drawing & Graphics +Auto CAD	K. Venugopal	New Age Publication
Engineering Drawing	R.K. Dhawan	S. Chand Co.
Engineering Drawing	P.J. Shah	
Engineering Graphics	K.R. Mohan	Dhanpat Rai and Publication Co.
Engineering Graphics	Dharmendra Kumar	Foundation Publishing House

Course outcomes:

At the end of the course, the student will be able to:

- Learning how to draw the shapes, angels and lines and others which is essential for engineer
- Develop student's imagination and ability to represent the shape size and specifications of physical objects.
- Familiarize with different drawing equipment, technical standards and procedures for construction of geometric figures. This will give students ability to draw three dimension objects on the paper and to drawthe pectoral drawings.
- Learning the main idea from assembly and detail drawing.

Computer Fundamentals

Subject Code	Theory			Credits
PAS1105	**No. of Period Per Week**			
	L	**T**	**P**	
	3	**1**	**0**	**4**
	-	-	-	

Course Objectives:

The main objective of this course is to introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking andmobile computing. It focuses on such computer literacy that prepares students for life-long learning of computer concepts and skills. Students discovers why computers are essential components in education, business and society inthis course.

- To understand basics of computer and working with OS.
- To develop working skills with productivity tools, graphics designing and Internet.
- To acquire basic programming skills.
- To apply computing in problem solving.

Contents: Theory

UNIT	Name Of The Topic	HOURS
01	**Fundamentals of computer** Introduction, Components of PC, The system Unit, Front part of system Unit Back part of system Unit CPU, Memory of computer Monitor, Mouse, Keyboard, Disk, Printer, Scanner, Modem, Video, Sound cards, Speakers	3
02	**Introduction to windows 2000/xp** Working with window Desktop Components of window Menu baroption Starting window Getting familiar with desktopMoving from one window to another Reverting windows to its previous size Opening task bar buttons into a windowsCreating shortcut of program Quitting windows	3
03	**GUI Based Editing, Spreadsheets, Tables & Presentation :** Application Using MS-Office 2000 & Open Office.Org Menus Opening of menus, Toolbars: standard toolbars, formatting toolbars & closing of menus Quitting Document, Editing & designing your document Spreadsheets Working & Manipulating data with Excel Changing the layout Working with simple graphs & Presentation Working With PowerPoint and Presentation.	3
04	**Introduction To Internet:** What is Internet Equipment Required for Internet connection Sending & receiving Emails Browsing the WWW Creating own EmailAccount Internet chatting.	2

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05	**Usage of Computer System in various Domains :** Computer application in Offices, books publication, data analysis, accounting , investment, inventory control, graphics, database management, Instrumentation, Airline and railway ticket reservation, robotics, artificial intelligence, military, banks, design and research work, real-time, point of sale terminals, financial transaction terminals.	2
06	**Information technology for benefits of community :** Impact of computer on society Social responsibilities Applications of IT Impact of IT Ethics and information technology Future with information technology.	3
	TOTAL	16

Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Comdex Computer Course kit	Vikas Gupta	Dream tech
Information Technology for Management	Henry Lucas	Tata McGraw Hills
Computer Fundamentals Architecture and Organization	B. Ram	New Age International Publisher
Computer Fundamentals	M. P. Singh	Foundation Publishing House

Course outcomes:

At the end of the course, the student will be able to:

- To acquire knowledge on editor, spread sheet and presentation software.
- Converse in basic computer terminology
- Formulate opinions about the impact of computers on society
- Possess the knowledge of basic hardware peripherals
- Familiarizing with Open Office (Word processing, Spreadsheets and Presentation).
- The students will be able to perform documentation and accounting operations.
- Students can learn how to perform presentation skills.

Basic Physics Lab

Subject Code	Theory			Credits
PAS1101P	**No. of Period Per Week**			
	L	**T**	**P**	**2**
	0	**0**	**3**	
	-	-	-	

Contents: Theory

Laboratory Experiments (Any ten experiments to be performed)

1. Use of vernier calipers for the measurement of dimensions of given object.
2. Use of micrometer screw gauge for the measurement of dimensions of given object
3. Determine the Young's modulus of material of wire using Searle's apparatus.
4. To observe rise in water level through capillaries of different bores.
5. Determine coefficient of viscosity of given oil using Stoke's Method.
6. Verification of Boyle's law.
7. Measurement of unknown temperature using thermocouple.
8. Determine the coefficient of linear expansion of given material of rod using Pullinger's apparatus.
9. To observe the divergence of laser light with respect to distance.
10. Plot characteristics of photoelectric cell (Photoelectric current verses intensity of light and voltage (applied).
11. Comparison of Illuminating Power (Luminous intensity) of two light sources using photoelectric cell.
12. Verification of Charles's law.

Basic Chemistry Lab

Subject Code	Theory			Credits
PAS1102P	No. of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Contents: Theory

Laboratory Experiments (Any ten experiments to be performed)

1 – 7 Qualitative Analysis of **Seven Solutions**, Containing One Basic & One Acidic Radical Listed below :-
Basic Radicals:- Pb+2, Cu+2, Al+3, Fe+2, Fe+3, Cr+3, Zn+2, Ni+2, Ca+2, Ba+2, Mg+2, K+, NH4 +
Acidic Radicals: - Cl–, Br–, I–, CO3–2, SO4–2, NO3–.
8. To Determine E.C.E. of Cu by Using CuSO4 Solution & Copper Electrode.
9. To Determine the % of Fe in the Given Ferrous Alloy by KMnO4 Method.
10. To Prepare a Chart Showing Application of Metals like Fe, Cu, Al, Cr, Ni, Sn, Pb, Co.
11. To Prepare Phenol Formaldehyde Resin (Bakelite).
12. To Determine Carbon Monoxide Content in Emission from Petrol Vehicle.
13. To Determine Dissolved Oxygen in a Water Sample.

Computer Fundamental Lab

Subject Code	Theory			Credits
PAS1105P	**No. of Period Per Week**			
	L	**T**	**P**	**1**
	0	**0**	**2**	
	-	-	-	

Contents: Theory

Laboratory Experiments (Any ten experiments to be performed)

1. Working with Windows 2000 desktop, start icon, taskbar, Recycle Bin, My Computer iconThe Recycle Bin and deleted files creating shortcuts on the desktop.

2. The Windows 2000 accessories WordPad – editing an existing document Use of Paint – drawing toolsThe Calculator, Clock

3. The Windows Explorer window, concept of drives, folders and files?
   Folder selection techniques, Switching drives, Folder creation Moving or
   copying files,Renaming, Deleting files and folders

4. Printing**,** Installing a printer driver, Setting up a printer, Default and installed printers, Controlling print queues, Viewing installed fonts**,** The clipboard and 'drag and drop'**,** Basic clipboard concepts**,** Linking vs.embedding

5. Moving through a Word document menu bar and drop down menus toolbars

6. Entering text into a Word 2000 document, selection techniques Deleting text

7. Font formatting keyboard shortcuts

8. Paragraph formattingBullets and numbering

9. Page formatting: What is page formatting? Page margins, Page size and orientation Page breaks, Headers and footers.

10. Introducing tables and columns

11. Printing within Word 2000 Print setup Printing options Print preview

12. Development of application using mail merge Mail merging addresses for envelopes Printing anaddressed envelope and letter.

13. Creating and using macros in a document

14. Creating and opening workbooks Entering data

15. Navigating in the worksheet, Selecting items within Excel 2000, Inserting and deleting cells, rows and column, Moving between worksheets, saving worksheet, workbook.

16. Formatting and customizing data

17. Formulas, functions and named ranges

18. Creating, manipulating & changing the chart type

19. Printing, Page setup, Margins Sheet printing options, Printing a worksheet

20. Preparing presentations with Microsoft Power Point. Slides and presentations, Opening an existing presentation , Saving a presentation

21. Using the Auto Content wizard, Starting the Auto Content wizard Selecting a presentation type withinthe Auto Content wizard Presentation type Presentation titles, footers and slide number.

22. Creating a simple text slide**,** Selecting a slide layout**,** Manipulating slide information within normal and outline view**,** Formatting and proofing text**,** Pictures and backgrounds**,** drawing toolbar**,** AutoShapes, Using clipart, Selecting objects, Grouping and un-grouping objects, The format painter
23. Creating and running a slide show**,** Navigating through a slide show**,** Slide show transitions**,** Slideshow timings**,** Animation effects
24. Microsoft Internet Explorer 5 & the Internet**,** Connecting to the Internet, The Internet Explorer program window**,** The on-line web tutorial Using hyper links**,** Responding to an email link on a web page
25. Searching the Internet**,** Searching the web via Microsoft Internet Explorer**,** Searching the Internet usingWeb Crawler**,** Searching the Internet using Yahoo**,** Commonly used search engines
26. Favorites, security & customizing Explorer**,** Organizing Favorite web sites**,** Customizing options – general, security, contents, connection, programs, advanced
27. Using the Address Book**,** Adding a new contact**,** Creating a mailing group**,** Addressing a message,Finding an e-mail address
28. Using electronic mail**,** Starting Outlook Express**,** Using the Outlook Express window**,** Changing the window layout**,** Reading file attachment**,** Taking action on message-deleting, forwarding, replying
29. Email & newsgroups**,** Creating and sending emails**,** Attached files**,** Receiving emails**,** Locating andsubscribing to newsgroups**,** Posting a message to a newsgroup
30. Chatting on internet**,** Understating Microsoft chat environment**,** Chat toolbar

Basic workshop practice

Subject Code	Theory			Credits
PME1102P	No. of Period Per Week			
	L	T	P	
	0	0	2	1
	-	-	-	

Contents: Theory

S. No.	List Of Practical's
1	**Wood working shop:** • Demonstration of different wood working tools / machines. • Demonstration of different wood working processes, like plaining, marking, chiseling,grooving, turning of wood etc. • One simple job involving any one joint like mortise and tenon dovetail, bridle, half lapetc.
2	**Welding shop** : • Demonstration of different welding tools / machines. • Demonstration on Arc Welding, Gas Welding, gas cutting and rebuilding of broken Parts with welding. • One simple job involving butt and lap joint.
3	**Fitting shop**: • Demonstration of different fitting tools and drilling machines and power tools • Demonstration of different operations like chipping, filing, drilling, tapping, cutting etc. • One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc.
4	**Plumbing shop** : • Demonstration of different plumbing tools • Demonstration of different operations in plumbing, observing different pipe joints andpipe accessories. Different samples of PVC pipes and PVC pipe fittings. • One job on simple pipe joint with nipple coupling for standard pipe. Pipe threadingusing standard die sets.
5	**Sheet metal shop** : • Demonstration of different sheet metal tools / machines. • Demonstration of different sheet metal operations like sheet cutting, bending, edging,End curling, lancing, soldering and riveting. • One simple job involving sheet metal operations and soldering and riveting.

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Workshop Technology	S.K. Hajara Chaudhary	Media Promotors & Publishers, New Delhi
Workshop Technology	B.S. Raghuwanshi	Workshop Technology B.S.Raghuwanshi Dhanpat Rai and Sons, New Delhi

Semester-II

Theory

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1	PAS1201	Communication Skills-II	3	1	0	4
2	PAS1202	Engg. Mathematics	4	1	0	5
3	PAS1203	Applied Science	3	1	0	4
4	PME1201	Engg. Mechanics	3	1	0	4
5	PME1202	Engg. Drawing	4	1	0	5

Practical

S. No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
6	PAS1201P	Communication Skills (Language Lab)	0	0	2	1
7	PAS1203P	Applied Science	0	0	2	1
8	PME1201P	Engineering Mechanics	0	0	2	1
9	PME1203P	Workshop Practice	0	0	3	2
Total						**27**

Communication Skill -II

Subject Code	Theory			Credits
PAS1201	No. of Period Per Week			
	L	T	P	4
	3	1	0	
	-	-	-	

Course Objectives:

Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus, the main objectives of this course are:

- To develop confidence in speaking English with correct pronunciation;
- To develop communication skills of the students i.e. listening, speaking, reading and writing skills.
- To introduce the need for personality development. Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc.

Contents: Theory

Unit	Name of the topic	Hours
01	**Introduction to communication :** 1.1 Definition , Communication Cycle/Process, 1.2 The elements of communication: sender- message – channel-Receiver – Feedback & Context. 1.3 Definition of Communication Process. 1.4 Stages in the process: defining the context, knowing the audience, designing the message, encoding, selecting proper channels, transmitting, receiving, decoding and giving feedback.	2
02	**Types of communication :** 2.1 Formal- Informal, Verbal- Nonverbal, Vertical- Horizontal- Diagonal	2
03	**Principals of effective communication :** 3.1 Definition of Effective Communication.. 3.2 Communication Barriers & how to overcome them. 3.3 Developing effective messages: Thinking about purpose, knowing the audience, structuring the message, selecting proper channels, minimizing barriers & facilitating feedback.	2
04	**Non-verbal- graphic communication**: 4.1 Non- verbal codes: A- Kinesics , B- Proxemics , C – Haptics D-Vocalics , EP physical appearance. F –Chronemics ,G –Artifacts Aspects of Body Language Interpreting Visuals &illustrating with Visuals like Tables, Charts & graphs.	4
05	**Formal written skills :** 5.1 Office Drafting: Circular, Notice, and Memo. 5.2 Job Application with resume. 5.3 Business correspondence: Enquiry, Order letter, Complaint letter, and Adjustment letter. 5.4 Report writing: Accident report, fall in production, Progress /Investigative. 5.5 Defining & describing objects & giving Instructions.	6

		16
	Total	**16**

[kaM	हिन्दी	Hours
1	पारचय एव प्रक्र◌िया, सप्रषण क तत्व, प्रषक, सदश, चनल, ग्राहक, फाडबक एव सदभ सप्रषण प्रक्र◌िया की परिर◌ाषा, संप्रेषण, प्रक्र◌िया के सोपान, संदर्भ,	2
2	श्राता समुदाय, सदभ का स्वरूप, माध्यम का चयन प्रस्तुक्रत म दृश्य चाभ, र◌ंबल आक्रद का प्रयाग । संप्रेषण के प्रका◌ि, औपचारिक, अनौपचारिक, र◌ाक्रषक एवं गैी र◌ाक्रषक, प्रर◌ावशाली संप्रेषण की परिर◌ाषा, प्रका◌ि,	2
3	सप्रषण, प्रर◌ावशाला सदश का तया◌◌ा एव स्वरूप फाडबक, माक्रा◌िक सप्रषण एव शा◌◌ारिक र◌ाषा प्रका◌ि, तौ◌ि तीिके एवं आधार◌िर◌ूत क्रशष्टाचा◌ि, शा◌िारिरिक र◌ाषा द्रा◌िा संप्रेषण, मु◌िाकृक्रत द्रा◌िा संप्रेषण,	2
4	सामूक्रहक पारचचाभ क्रववाद, वक्तृत्व शला का क्रवकास, कायभर◌ा◌ि सप्रषण प्रक्रा◌िया से सबक्रधत डायग्राम, संप्रेषण के प्रका◌ि एवं क्रस◌िक्रत, क्रवषय के अनुसा◌ि कहानी ले◌िन एवं अनुच्छेद ले◌िन, तकनीकी एवं वैज्ञाक्रनक शब्दावली, बैंक से संबंक्रधत शब्दावली, व्यवसाक्रयक पत्र	2
	Total	**8**

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Developing Communication Skills	Krushna Mohan, Meera Banerji	Macmillan
Communication Skills	Joyeeta Bhattacharya.	Reliable Series
Every ones guide to effective writing	Jayakaran	Apple Publishing
Communication Skills-II	Kajari Guha	Foundation Publishing House
The Functional Aspects of Communication Skills	Dr. P. Prasad	S.K. Kataria & Sons.
Communication Skills	Leena Sen	Prentice Hall of India Pvt. Ltd.
Professional Communication	Dr. Raavee Tripathi	S.K. Kataria & Sons.
Technical Communication for Engineers	Shalini Verma	Vikas Publishing Home Pvt. Ltd.
Effectual Communication Skills	Bhupender Kour	S.K. Kataria & Sons.

Course outcomes:

At the end of this course, the participants will:
- Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.
- Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication.
- Also develop skills of group presentation and communication in team.
- Develop non-verbal communication such as proper use of body language and gestures.

Engineering Mathematics

Subject Code	Theory			Credits
PAS1202	No. of Period Per Week			
	L	T	P	5
	4	1	0	
	-	-	-	

Course Objectives:

- To visualize and conceptualize the engineering problems.
- To model the engineering problem mathematically using theory of calculus and matrices.
- To determine the solution of the studied engineering problem from application point of view.

Contents: Theory

Unit	Name of the topic	Hours
01	**Function and Limit :** **1.1 Function** 1.1.1 Definitions of variable, constant, intervals such as open, closed, semi-open etc. 1.1.2 Definition of Function, value of a function and types of functions, Simple Examples. **1.2 Limits** 1.2.1 Definition of neighbourhood, concept and definition limit. 1.2.2 Limits of algebraic, trigonometric, exponential and logarithmic functions with simple examples.	9
02	**Derivatives :** 2.1 Definition of Derivatives, notations. 2.2 Derivatives of Standard Functions 2.3 Rules of Differentiation. (Without proof). Such as Derivatives of Sum or difference, scalar multiplication, Product and quotient. 2.4 Derivatives of composite function (Chain rule) 2.5 Derivatives of inverse and inverse trigonometric functions. 2.6 Derivatives of Implicit Function 2.7 Logarithmic differentiation 2.8 Derivatives of parametric Functions. 2.9 Derivatives of one function w.r.t another function 2.10 Second order Differentiation.	12

03	**Statistics and Probability :**	
	3.1 Statistics	
	3.1.1 Measures of Central tendency (mean, median, and mode) for ungrouped and grouped frequency distribution.	**12**
	3.1.2 Graphical representation (Histogram and Ogive Curves) to find mode and median.	
	3.1.3 Measures of Dispersion such as range, mean deviation, Standard Deviation, Variance and coefficient of variation. Comparison of two sets of observations.	
	3.2 Probability	
	3.2.1 Definition of random experiment, sample space, event, Occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely).	

	3.2.2 Definition of Probability, addition and multiplication theorems of Probability.	
04	**4.1 Applications of derivative**	
	4.1.1 Geometrical meaning of Derivative, Equation of tangent and Normal.	
	4.1.2 Rates and Motion	
	4.1.3 Maxima and minima	
	4.1.4 Radius of Curvature	
	4.2 Complex number	
	4.2.1 Definition of Complex number. Cartesian, polar, Exponential forms of Complex number.	**9**
	4.2.2 Algebra of Complex number(Equality, addition, Subtraction, Multiplication and Division)	
	4.2.3 De-Moivre's theorem (without proof) and simple problems. Euler's form of Circular functions, hyperbolic functions and relations between circular & hyperbolic Functions.	
05	**5.1 Numerical Solution of Algebraic Equations**	
	5.1.1 Bisection method, Regula- Falsi method and Newton- Raphson method.	
	5.2 Numerical Solution of Simultaneous Equations	
	5.2.1 Gauss elimination method	**6**
	5.2.2 Iterative methods-Gauss Seidal and Jacobi's method.	
	Total	**48**

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Mathematics for Polytechnic	S.P. Deshpande	Pune Vidyarthi Griha Prakashan Pune.
Advanced Engineering Mathematics	Dass H.K.	S. Chand Publication, New Delhi
Calculus single Variable	Robert T Smith	Tata McGraw Hill
Fundamentals of Mathematical Statistics	S.C. Gupta and Kapoor	S. Chand Publication New Delhi
Higher Engineering Mathematics	B.S. Grewal	Khanna Publication, New Delhi
Applied Mathematics	P.N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune.

Engineering Mathematics	Sindhu Prasad	Foundation Publishing House

Course outcomes:

At the end of this course, the students will be able:
- To visualize and conceptualize the engineering problems.
- To model the engineering problem mathematically using theory of calculus and matrices.
- To determine the solution of the studied engineering problem from application point of view.
- To validate the solution.
- To implement the solution for engineering problem.

Course Code	PAS 1203
Course Title	Applied Science
Number of Credits	4(L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PAS

Course Objectives:-

- Applied Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave.
- Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.
- The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology based applications.

CONTENTS: THEORY

Unit	PHYSICS(A)	
01	**1. Kinematics** **1.1 Rectilinear Motion** Equations of Motions- $v = u+at$, $S = ut+1/2at^2$, $V^2 = u^2+2as$ (only equation), Distance traveled by particle in nth second, Velocity Time Diagrams-uniform velocity, uniform acceleration and uniform retardation, equations of motion for motion under gravity. **1.2 Angular Motion** Definition of angular displacement, angular velocity, angular acceleration, Relation between angular velocity and linear velocity, Three equations of circular motion (no derivation) angular distance traveled by particle in nth second (only equation), Definition of S.H.M. and S.H.M. as projection of uniform circular motion on any one diameter, Equation of S.H.M. and Graphical representation of displacement, velocity, acceleration of particle in S.H.M. for S.H.M. starting from mean position and from extreme position.	7
02	**2. Kinetics** **2.1** Definitions of momentum, impulse, impulsive force, and Statements of Newton's laws of motion and with equations, Applications of laws of motion—Recoil of gun, Motion of two connected bodies by light inextensible string passing over smooth pulley, Motion of lift. **2.2 Work, Power, Energy** Definition of work, power and energy, equations for P.E. K.E., Work energy principle, Representation of work by using graph, Work done by a torque(no derivation).	7

03	**3. Non –destructive testing of Materials.** **3.1 T**esting methods of materials -Destructive and Non-destructive, Advantages and Limitations of N.D.T., Names of N.D.T. Methods used in industries, Factors on Which selection of N.D.T. dependents, Study of Principle, Set up, Procedure. **3.2** Working, Advantages, limitations, Applications and Application code of following N.D.T. methods -Penetrant method, Magnetic particle method,	**5**

	Radiography, Ultrasonic, Thermography.	
04	**Acoustics and Indoor Lighting of Buildings** **4.1 Acoustics** Weber and Fetcher's law, limit of intensity and loudness, echo, Reverberation and reverberation time (Sabine's formula) **,**Timbre(quality of sound), Pitch or Frequency of sound. Factors affecting Acoustical planning of auditorium-- echo, reverberation, creep, focusing, standing wave, coefficient of absorption, sound insulation, noise pollution and the different ways of controlling these factors. **4.2 Indoor lighting** Definition of luminous intensity, intensity of illumination with their SI units, Inverse square law and Photometric equation, Bunsen's photometer— ray diagram, working and applications, Need of indoor lighting, Indoor lighting schemes and Factors Affecting Indoor Lighting.	**5**
	Total	**24**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Physics –I	V. Rajendran	Tata McGraw - Hill
Applied Physics	Arthur Beiser	Tata McGraw - Hill
Engineering Physics	R.K. Gaurand and S.L. Gupta	Dhanpatrai
Phyiscs	Resrie and Holliday	-
Concept of Physics Part-I, II	H.C. Verma	-
Applied science	Roshan Kr. Sinha	Foundation Publishing House

(B) **CHEMISTRY**	
Unit	**Name Of The Topic**	**Hours**

01	**Electrochemistry** Definition of Electrolyte & Conductor, Difference between Metallic &Electrolytic Conduction, Ionisation, Degree of Ionisation & Factors Affecting Degree of Ionisation, Conductivity of Electrolytes. Definition of Electrochemical Cell, Battery, Charge, Discharge, Closed Circuit Voltage, Open Circuit Voltage, EMF, Internal Resistance, Separator, Classification of Batteries such as Primary, Secondary &Reserve with Examples. Industrial Application of Electrolysis – Metallic or Protective Factors for Selection of Method of Coating, Process of Electroplating, Electrorefining, Electrometallurgy (Applications of Electroplating), Impregnated Coating or Cementation on Base Metal Steel – Coating Metal Zn (Sheradizing),Cr (Chomozing), Al (Colorizing), Applications, Advantages & Disadvantages.	5
02	**Non Metallic Engineering Materials** (Plastic, Rubber, Insulators, Refractories, Composite Material, Ceramics) **1. Engineering Plastic:** Special Characteristics & Engineering Applications of Polyamides or Nylons, Polycarbonates (Like Lexan, Merlan), Polyurethanes(Like Perlon – U), Silicons, Polyacetals, Teflon, Laminated Plastic, Thermocole, Reinforced Plastic. **2. Ceramics:** Definition, Properties & Engineering Applications, Types – Structural Ceramics, Facing Material, Refractories, Fine Ceramics, Special Ceramics. **3. Refractories:** Definition, Properties, Applications & Uses of Fire Clay, Bricks, Silica Bricks. **4. Composite Materials:** Definition, Properties, Advantages, Applications & Examples.	5
03	**Metals & Alloys** **Metals** – Metallurgy of Iron, Terms Involved in Metallurgy, Indian Resources of Fe, Imp Ores, Extraction, Smelting in Blast Furnace, Chemical Reactions in Blast Furnace, Products of Blast Furnace, their Composition, Application, Commercial Forms of Iron, (Pig Iron /Cast Iron, Wrought or Malleable Steel), their Composition, Properties & Applications, Types of Casting (Chilled Casting, Centrifugal Casting & Malleable Casting), Heat Treatment, Heat Treatment of Cast Iron & Steel. **Alloys** – Definition, Types, Ferrous Alloys – Steel, Composition, Properties & Applications of Plain Carbon Steel (Low Carbon, Medium Carbon, High Carbon & Very Hard Steel) & Alloy Steels, (Heat Resisting, Shock Resisting, Magnetic, Stainless, Tool Steel & HSS), Effect of Various Alloying Elements (Cr, W, V, Ni, Mn, Mo, Si) etc. on Steel. Non-Ferrous Alloys – Copper Alloy – Brass, Bronze, Nickel Silver or German Silver, their Composition, Properties & Applications, Aluminium Alloy – Duralumin, Bearing Alloy – Babbitt Metal, Solders –Soft Solder, Brazing Alloy, Tinamann's Solder, Nickel Alloy – Monel Metal, Low Melting Alloys – Woods Metal.	8

04	**Corrosion** Definition, Types, Atmospheric or Chemical Corrosion, Mechanism, Factors Affecting Atmospheric, Corrosion & Immersed Corrosion or Electrochemical Corrosion, Mechanism, Protection of Metals by Purification of Metals, Alloy Formation, Cathode Protection, Controlling the External Conditions & Application of Protective Coatings i.e. Galvanising, Tinning, Metal Spraying, Sherardizing, Electroplating, Metal Clodding, Cementation or Diffusion Method, their Definition, Procedure, Uses, Advantages & Disadvantages, Examples of Non Corrosive Materials, Protection of Corrosion by the Use of Organic Coating Like Paint, Lacquer, Enamels, Emulsion Paints, Special Paints,their Properties & Uses. Special Paints – Heat Resistant, Cellulose Paint, Coaltar Paint, Antifouling Paint their constituents & applications.	6
05	**Lubricant** Lubricant, Types, Lubrication Mechanism by Fluid Film, Baundary, Extreme Pressure, Physical Characteristics of Lubricants Such as Viscosity, Viscosity Index, Oilness, Volatility, Flash & Fire Point, Cloud &Pour Point, Chemical Characteristics such as Acid Value or Neutralization Number, Emulsification, Saponification Value, Selection of Lubricants for Various Types of Machineries.	3

		Total	27

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons
Engineering Chemistry	S.S. Dara	S. Chand Publication
Industrial Chemistry	B.K. Sharma	Goel Publication
Environmental Chemistry & Pollution Control	S.S. Dara	S. Chand Publication
Applied science	Sanjay Kumar, Rahul Kumar	Foundation Publishing House

Course outcomes:

• Represent physical quantities as scalar and vectors and solve real life relevant problems.

• Analyse type of motions and apply the formulation to understand banking of roads/railway tracks and conservation of momentum principle to describe rocket propulsion, recoil of gun etc.

• Define scientific work, energy and power and their units. Derive relationships for work, energy and power and solve related problems.

Course Code	PME 1201
Course Title	Engineering Mechanics
Number of Credits	4(L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PME

Course Objectives:-
- To familiarize students with the key concepts and principles of digital marketing.
- To develop students' ability to create effective digital marketing strategies.
- To enhance students'skills in using digital marketing tools such as Google Analytics and social media platforms.

CONTENTS: THEORY

Unit	Name Of The Topic	Hours
	Force a. **Fundamentals: - Definitions of** mechanics, statics, dynamics. Engineering Mechanics, body, rigid body, mass, weight, length, time, scalar and vector, fundamental units, derived units, S.I. units.	
01	b. **Force**: - Definition of a force, unit force, Newton, S.I. unit of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility. c. **Resolution of a force:** Definition, Method of resolution, Types of component forces, Perpendicular components and Non perpendicular components. d. **Moment of a force: -** Definition, measurement of moment of a force, S. I. unit, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments Varignon's theorem of moment andit's use, couple – definition, S.I. unit, measurement of a couple, properties of couple. e. **Force system: -** Definition, classification of force system according to plane and line of action f. **Composition of Forces**: - Definition, Resultant force, methods of composition of forces, I – Analytical method:– (i) Trigonometric method (law of parallelogram of forces) (ii) Algebraic method (method of resolution),II – Graphical method: - Introduction, space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent, non-concurrent and parallel force system by analytical and graphical method.	12

02	**Equilibrium:** 2.1 Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram. 2.2 Lami's Theorem – statement and explanation, Application of Lami's theorem for solving various engineering problems. 2.3 Equilibrant – Definition, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system. 2.4 Beams – Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, hinged, roller), classification of loads, point load, uniformly distributed load. Reactions of a simply supported and over.	6
03	**Friction:** 3.1 Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction angle of repose and coeff. Of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction. 3.2 Equilibrium of bodies on level plane –external force applied horizontal and inclined up and down. 3.3 Equilibrium of bodies on inclined plane – external forces is applied parallel to the plane, horizontal and incline to inclined plane. 3.4 Ladder friction, Wedge and block.	8
04	**Centroid and Centre Of Gravity:** 4.1 **Centroid:** Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure. 4.2 **Center of gravity:** Definition, center of gravity. Of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids.	8
	Simple Machines: 5.1 Definitions of simple machine, compound machine , load , effort ,	
05	mechanical advantage , velocity ratio , input on a machine ,out put of a machine ,efficiency of a machine , expression for mechanical advantage , velocity ratio and efficiency of a machine. Ideal machine, ideal effort and ideal load, friction in machines, effort lost in friction and frictional load. 5.2 Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self locking machine. 5.3 Study of simple machines : Simple axle and wheel, differential axle and wheel, Weston's differential pulley block, single purchase crab, double purchase crab, worm and worm wheel, geared pulley block, screw jack, pulleys : First, second and third system of pulleys, gear train, hoist mechanism.	10
	Total	48

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**

Engineering Mechanics	Beer-Johnson	Tata McGraw Hill, Delhi
Engineering Mechanics	Basu	Tata McGraw Hill, Delhi
Vector Mechanics for Engineers Vol. - I & II	Joslph F. Shelley	Tata McGraw Hill, Delhi
Engg. Mechanics	Ram Manohar Pandey	Foundation Publishing House

Course Outcomes:
- Students will be able to explain the fundamental concepts and principles of digital marketing.
- Students will be able to design and implement a comprehensive digital marketing strategy.
- Students will be able to analyze digital marketing metrics and generate performance reports using Google Analytics.

Course Code	PME 1202
Course Title	Engineering Drawing
Number of Credits	4(L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PME

Course Objectives :-

To introduce the students, the techniques of constructing the various types of polygons, curves and scales.

Unit	Name Of The Topic	Hours
01	**Sectional Views.** 1.1 Types of sections 1.2 Conversion of pictorial view into sectional orthographic views (First Angle Projection Method only)	3
02	**Missing Views.** 2.1 Draw missing view from the given Orthographic views – simple components (First Angle Projection Method only)	1
03	**Isometric Projection** 3.1 Conversion of Orthographic Views into Isometric view/projection (Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces).	3
04	**Projections of Solids.** 4.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other.	2
05	**Sections of Solids.** 5.1 Solids: -Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube. 5.2 Cone, Pyramid and Tetrahedron resting on their base on Horizontal Plane. 5.3 Prism, Cylinder: -a)Axis parallel to both the reference plane b) Resting on their base on HP. 5.4 Section plane inclined to one reference plane and perpendicular to other.	3
06	**Developments of Surfaces.** Developments of Lateral surfaces of cube, prisms, cylinder, pyramids, cone and their applications such as tray, funnel, Chimney, pipe bends etc.	2
07	**Free Hand Sketches** 7.1 Free hand sketches of nuts, bolts, rivets, threads, split pin, foundation bolts,	2
	Total	16

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Drawing	N.D. Bhatta	Charotkar Publishing House

Engineering Drawing	R.K. Dhawan	S. Chand Co.

Engineering Drawing P.J. Shah	Engineering Drawing P.J. Shah	-
Machine Drawing	N.D. Bhatta	Charotkar Publishing House
Engineering Drawing and Graphics + Auto CAD	K. Venugopal	New Age Publication
Engineering Graphics	K.R. Mohan	Dhanpat Rai and Publication Co.
Machine Drawing	R.K. Dhawan	S. Chand Co.
Engineering Drawing	Dharmendra Kumar	Foundation Publishing House

Course Outcomes:
• To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
• To impart knowledge on the projection of points, lines and plane surfaces
• To improve the visualization skills for better understanding of projection of solids
• To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces
• To make the students understand the viewing perception of a solid object in Isometric and Perspective projections

Course Code	**PAS 1201P**
Course Title	**Communication Skills(Language Lab)**
Number of Credits	**1(L: 0, T: 0, P: 1)**
Prerequisites	**NIL**
Course Category	**PASP**

CONTENTS: PRACTICAL

Assignments:

1. Communication Cycle (With The Help Of Diagram)
2. Communication Situations (List Of 5 Communication situations stating the types of Communication
3. Barriers That Hinder A Particular Communication Situation. (State the type of barrier, and how to overcome them)

4. Developing A Story Or A Paragraph For The Given Topic Sentence.(in a group of 5 – 6 students)
5. Describing Various Equipment's.
6. Identifying The Various Sentences With Their Type Of Writing. (e.g. Scientific, Legal, Colloquial etc.)
7. Business Letters

8. Letters Of Suggestion
9. Comparative Time Table Of 2 Students
10. Description Of Two Different Persons.(seeing the picture)
11. Letter To The Librarian, Principal
12. Report Writing

NOTE: The above assignments are suggested to be completed in the prescribed work-book.

Course Code	PAS 1201P
Course Title	Applied Science Lab
Number of Credits	1(L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PASP

CONTENTS: PRACTICAL

List of Experiments (PHYSICS):

1. To represent simple harmonic motion with the help of vertical oscillation of spring and to determine spring constant (K) (Stiffness Constant)
2. To determine time period of oscillation of compound bar pendulum and calculate acceleration due to gravity.
3. To determine the velocity of sound by using resonance tube
4. To compare luminous intensities of two luminous bodies by using Bunsen's photometer.
5. To calculate coefficient of absorption for acoustical materials
6. To determine Joule's constant (J) by electric method
7. To determine wavelength of Sodium light by using Newton's rings

List of Experiments (CHEMISTRY):

1. To determine neutralization point of weak acid and weak base by conductivity meter.

2. To determine end point of titration between dil. H2SO4 and BaCl2 using conductivity meter.
3. To verify Faraday's second law of electrolysis.
4. To determine pH of given solution by using pH paper, universal indicator and pH meter.
5. To determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution using pH meter.
6. To determine percentage of copper from brass iodometrically.
7. To find the rate of corrosion of Al strip in acidic and basic medium graphically.

8. To determine thinner content in paint.
9. To determine acid value of given lubricant.
10. To determine viscosity of given oil by using Ostwald's viscometer.
11. To determine saponification value of given lubricant

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Course Code	PME 1201P
Course Title	Engineering Mechanics
Number of Credits	1(L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PMEP

CONTENTS: PRACTICA

Skills to be developed:
1.Intellectual Skill: A. Calculate the forces on given structure
B. Interpret the results
2. Motor Skills: A. Handle the equipment carefully
B. Draw graph
Any five experiments from Group A,B and graphical solution in Group C :
Group A:
1) Verify law of polygon of forces
2) Verify law of moments
3) Verification of Lami's theorem
4) Forces in members of a jib crane.
5) Comparison of coefficient of friction of various pair of surfaces and
6) determination of angle of repose
7) Equilibrium of parallel forces – simply supported beam reactions.
8) Experimental location of centre of gravity of plane plate of uniform thickness.
Group B:
To find MA, VR, Efficiency, Ideal Effort, Effort lost in friction for various loads and establish
law of machine and calculate maximum efficiency.
Also check the reversibility of a machine (Any five):
1) Differential axle and wheel
2) Weston's differential pulley block
3) Geared pulley block
4) Single purchase crab

5) Double purchase crab
6) Worm and worm wheel
7) Two sheave and three sheave pulley block
8) Screw jack.
Group C:
A 2 Size drawing sheets containing graphical solutions for –
1) Concurrent force system : Two problems
2) Parallel force system : Two problems
3) Reactions of a beam : Two problems

Course Code	PME 1203P
Course Title	Workshop Practice
Number of Credits	2(L: 0, T: 0, P: 3)
Prerequisites	NIL
Course Category	PMEP

CONTENTS:PRACTICAL

S.No.	List Of Practical's
1	**CARPENTERY SHOP:** • Any one composite job from the following involving different joint, turning and planning, surface finishing by emery paper, varnishing etc. like square stool, tea table, center table, chaurang, table lamp bed sofaset, book rack. Cabinet, notice board, shows cases, tables chairs etc. Note: 1] One job of standard size (Saleable article shall be preferred) 2] Batch size should be selected depending on volume of work. 3] Job allotted should comprise of 6-8 hours of actual working 4] Student shall calculate the cost of material and labor cost for their job from the drawing.
2	**WELDING SHOP** • Any one composite job from involving butt joint lap joint welding process, from the following like Grill, door, window frame, waste paper basket, Chappel stand, Corner flower stand chair , table frame (squarepipe 25 mm) cooler frame (folding type) **Note:** 1] One job of standard size (Saleable/marketable article shall be preferred) 2] Batch size should be selected depending on volume of work . 3] Job allotted should comprise of 6-8 hours of actual working operations. 4] Student shall calculate the cost of material and labor required for their job from the drawing.

3	**SMITHY SHOP** • Demonstration of different forging tools and Power Hammer. • Demonstration of different forging processes, likes shaping, caulking fullering, setting down operations etc. • One job like hook peg, flat chisel or any hardware item. • **Note**: 1]One job of standard size (Saleable/marketable article shall be preferred) 2] Job allotted should comprise of 4-6 hours of actual working operations. 3] Student shall calculate the cost of material and labor required for their job from the drawing.

4	**PLUMBING SHOP :** • Demonstration of PVC pipe joint with various fittings. • Exercise for students on preparing actual pipeline layout for G.I. Pipe or PVC pipe. Preparing actual drawing and bill of material. Note:1] One job of standard size (Saleable/marketable article shall be preferred) 2] Batch size should be selected depending on volume of work. 3] Job allotted should comprise of 6-8 hours of actual working 4] Student shall calculate the cost of material and labor cost for their job from the drawing.
5	*SHEET METAL SHOP* • One composite job from the following: Letter box, Trunk, Grain Container, Water-heater Container, Bucket, Waste Paper Basket, Cooler Tray, Water-draining Channel, etc.(including soldering and riveting) Note: 1] One job of standard size (Saleable/marketable article shall be preferred) K.K.U-DIPLOMA(E.E) Page 39 2] Batch size should be selected depending on volume of work. 3] Job allotted should comprise of 4-6 hours of actual working ions. 4] Student shall calculate the cost of material and labor cost required for their job from the drawing.
6	**Demonstration of power tools and practice of utility items.** • Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. • Making of electrical switchboard with 2 sockets and piano buttons and with electrical wiring. • Any other item as per the requirement of college/Deptt./

Course Objectives:

Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus, the main objectives of this course are:

To develop confidence in speaking English with correct pronunciation;

To develop communication skills of the students i.e. listening, speaking, reading and writing skills.

To introduce the need for personality development. Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills

CONTENTS: THEORY

UNIT	Name Of The Topic	Hours
01	**Introduction to communication :** 1.1 Definition , Communication Cycle/Process, 1.2 The elements of communication : sender- message – channel- Receiver –Feedback & Context. 1.3 Definition of Communication Process. 1.4 Stages in the process : defining the context, knowing the audience, designing the message, encoding , selecting proper channels, transmitting, receiving, decoding and giving feedback.	2
02	**Types of communication :** 2.1 Formal- Informal, Verbal- Nonverbal, Vertical- Horizontal- Diagonal	2
03	**Principals of effective communication :** 3.1 Definition of Effective Communication.. 3.2 Communication Barriers & how to overcome them. 3.3 Developing effective messages: Thinking about purpose, knowing the audience, structuring the message, selecting proper channels, minimizing barriers & facilitating feedback.	2
04	**Non verbal- graphic communication**: 4.1 Non- verbal codes: A- Kinesics , B- Proxemics , C – Haptics D-Vocalics , EP hysical appearance. F –Chronemics ,G –Artifacts Aspects of Body Language Interpreting Visuals &illustrating with Visuals like Tables, Charts & graphs.	4
05	**Formal written skills :** 5.1 Office Drafting: Circular, Notice , and Memo. 5.2 Job Application with resume. 5.3 Business correspondence: Enquiry, Order letter, Complaint letter, and Adjustment letter. 5.4 Report writing: Accident report, fall in production, Progress /Investigative. 5.5 Defining & describing objects & giving Instructions.	6
	Total	16

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	परिचयएवंप्रक्रिया,संप्रेषणकेतत्व,प्रेषक,संदेश,चैनल,ग्राहक,फीडबैकएवंसंदर्भसंप्रेषणप्रक्रियाकीपरिर॒ाषा,संप्रेषण,प्रक्रियाकेसोपान,संदर्भ,	2
	श्रोतासमुदाय,संदर्भकास्वरूप,माध्यमकाचयनप्रस्तुततमेंदृश्यचार्भ,र॒बलआदददकाप्रयोग ंसंप्रेषणकेप्रकाि॒,औपचारिक,अनौपचारिक,र॒ाषषकएवंगैिर॒ाषषक,प्रर॒ावशालीसंप्रेषणकीपरिर॒ाषा,प्रकाि॒,	2
	संप्रेषण,प्रर॒ावशालीसंदेशकीतैयािर॒ीएवंस्वरूपफीडबैक,मौखिकसंप्रेषणएवंशािर॒ीरिकर॒ाषाप्रकाि॒,तौिि॒ती केएवंआधािर॒ूतशशास्त्रर॒ाचाि॒,शािर॒ीरिकर॒ाषाद्वाि॒ासंप्रेषण,मुिि॒कृततद्वाि॒ासंप्रेषण,	2
	सामूदहकपरिचचाभषववाद,वक्तृत्वशैलीकाषवकास,कायभर॒ािसंप्रेषणप्रक्रियासेसंबंधधतडायग्राम,संप्रेषणकेप्रकाि॒एवंस्सि॒तत,षवषयकेअनुसाि॒कहानीलेि॒िनएवंअनुच्छेदलेि॒िन,तकनीकीएवंवैज्ञातनकशब्दावली,बैंकसेसंबंधधतशब्दावली,व्यवसातयकपत्र	2

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Developing Communication Skills	Krushna Mohan, Meera Banerji	Macmillan
Communication Skills	Joyeeta Bhattacharya.	Reliable Series
Every ones guide to effective writing	Jayakaran	Apple Publishing
Communication Skills-II	Kajari Guha	Foundation Publishing House
The Functional Aspects of Communication Skills	Dr. P. Prasad	S.K. Kataria & Sons.
Communication Skills	Leena Sen	Prentice Hall of India Pvt. Ltd.
Professional Communication	Dr. Raavee Tripathi	S.K. Kataria & Sons.
Technical Communication for Engineers	Shalini Verma	Vikas Publishing Home Pvt. Ltd.
Effectual Communication Skills	Bhupender Kour	S.K. Kataria & Sons.

Course outcomes:

At the end of this course, the participants will:

- Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.
- Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of   oral communication.
- Also develop skills of group presentation and communication in team.

• Develop non-verbal communication such as proper use of body language and gestures.

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CourseCode		PAS1202
CourseTitle		Engineering Mathematics
NumberofCredits		5(L:4,T:1,P:0)
Prerequisites		NIL
CourseCategory		PAS

CONTENTS: THEORY

Course Objectives:

- To visualize and conceptualize the engineering problems.
- To model the engineering problem mathematically using theory of calculus and matrices.
- To determine the solution of the studied engineering problem from application point of view.

Unit	Name Of The Topic	

	Function and Limit :	
01	**1.1 Function** 1.1.1 Definitions of variable, constant, intervals such as open, closed, semi-open etc. 1.1.2 Definition of Function, value of a function and types of functions, Simple Examples. **1.2 Limits** 1.2.1 Definition of neighborhood, concept and definition limit. 1.2.2 Limits of algebraic, trigonometric, exponential and logarithmic functions with simple examples.	9
02	**Derivatives :** 2.1 Definition of Derivatives, notations. 2.2 Derivatives of Standard Functions 2.3 Rules of Differentiation. (Without proof). Such as Derivatives of Sum or difference, scalar multiplication, Product and quotient. 2.4 Derivatives of composite function (Chain rule) 2.5 Derivatives of inverse and inverse trigonometric functions. 2.6 Derivatives of Implicit Function 2.7 Logarithmic differentiation 2.8 Derivatives of parametric Functions. 2.9 Derivatives of one function w.r.t another function 2.10 Second order Differentiation.	12
03	**Statistics and Probability :** **3.1 Statistics** 3.1.1 Measures of Central tendency (mean, median, mode) for ungrouped and grouped frequency distribution. 3.1.2 Graphical representation (Histogram and Ogive Curves) to find mode and median. 3.1.3 Measures of Dispersion such as range, mean deviation, Standard Deviation, Variance and coefficient of variation. Comparison of two sets of observations. **3.2 Probability** 3.2.1 Definition of random experiment, sample space, event, Occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely). 3.2.2 Definition of Probability, addition and multiplication theorems of Probability.	12

04	**4.1 Applications of derivative** 4.1.1 Geometrical meaning of Derivative, Equation of tangent and Normal. 4.1.2 Rates and Motion 4.1.3 Maxima and minima 4.1.4 Radius of Curvature **4.2 Complex number** 4.2.1 Definition of Complex number. Cartesian, polar, Exponential forms of Complex number. 4.2.2 Algebra of Complex number(Equality, addition, Subtraction, Multiplication and Division) 4.2.3 De-Moivre's theorem (without proof) and simple problems. Euler's form of	9

	Circular functions, hyperbolic functions and relations between circular &hyperbolic Functions.	
05	**5.1 Numerical Solution of Algebraic Equations** 5.1.1 Bisection method, Regula- Falsi method and Newton- Raphson method. **5.2 Numerical Solution of Simultaneous Equations** 5.2.1 Gauss elimination method 5.2.2 Iterative methods-Gauss Seidal and Jacobi's method.	6
	Total	48

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Mathematics for Polytechnic	S.P. Deshpande	Pune Vidyarthi Griha Prakashan Pune.
Advanced Engineering Mathematics	Dass H.K.	S. Chand Publication, New Delhi
Calculus single Variable	Robert T Smith	Tata McGraw Hill
Fundamentals of Mathematical Statistics	S.C. Gupta and Kapoor	S. Chand Publication New Delhi
Higher Engineering Mathematics	B.S. Grewal	Khanna Publication, New Delhi
Applied Mathematics	P.N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune.
Engineering Mathematics	Sindhu Prasad	Foundation Publishing House

Course outcomes:

At the end of this course, the students will be able:
- To visualize and conceptualize the engineering problems.

- To model the engineering problem mathematically using theory of calculus and matrices.
- To determine the solution of the studied engineering problem from application point of view.
- To validate the solution.
- To implement the solution for engineering problem.

CourseCode		PAS1203
CourseTitle		Applied Science
NumberofCredits		4(L:3,T:1,P:0)
Prerequisites		NIL
CourseCategory		PAS

Course Objectives :-

- Applied Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave.
- Concrete use of physical principles and analysis in various fields of engineering and technology are

given prominence in the course content.

- The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology based applications.

CONTENTS:THEORY

Unit	PHYSICS(A)	
01	**1. Kinematics** **1.1 Rectilinear Motion** Equations of Motions- $v = u+at$, $S = ut+1/2at_2$, $V_2 = u_2+2as$ (only equation), Distance traveled by particle in nth second, Velocity Time Diagrams-uniform velocity, uniform acceleration and uniform retardation, equations of motion for motion under gravity. **1.2 Angular Motion** Definition of angular displacement, angular velocity, angular acceleration, Relation between angular velocity and linear velocity, Three equations of circular motion (no derivation) angular distance traveled by particle in nth second (only equation), Definition of S.H.M. and S.H.M. as projection of uniform circular motion on any one diameter, Equation of S.H.M. and Graphical representation of displacement ,velocity, acceleration of particle in S.H.M. for S.H.M. starting from mean position and from extreme position.	7
02	**2. Kinetics** **2.1** Definitions of momentum, impulse, impulsive force, Statements of Newton's laws of motion and with equations, Applications of laws of motion—Recoil of gun, Motion of two connected bodies by light inextensible string passing over smooth pulley, Motion of lift. **2.2 Work, Power, Energy** Definition of work, power and energy, equations for P.E. K.E., Work energy principle, Representation of work by using graph, Work done by a torque(no derivation).	7
03	**3. Non –destructive testing of Materials.** **3.1 T**esting methods of materials -Destructive and Nondestructive, Advantages and Limitations of N.D.T., Names of N.D.T. Methods used in industries, Factors on Which selection of N.D.T. dependents, Study of Principle, Set up, Procedure. **3.2** Working, Advantages, limitations, Applications and Application code of following N.D.T. methods -Penetrant method, Magnetic particle method, Radiography, Ultrasonic, Thermography.	5

04	**Acoustics and Indoor Lighting of Buildings** **4.1 Acoustics** Weber and Fetcher's law, limit of intensity and loudness, echo, Reverberation and reverberation time (Sabine's formula) ,Timbre(quality of sound), Pitch or Frequency of sound. Factors affecting Acoustical planning of auditorium-- echo, reverberation, creep, focusing, standing wave, coefficient of absorption, sound insulation, noise pollution and the different ways of controlling these factors.	5

	4.2 Indoor lighting Definition of luminous intensity, intensity of illumination with their SI units, Inverse square law and Photometric equation, Bunsen's photometer— ray diagram, working and applications, Need of indoor lighting, Indoor lighting schemes and Factors Affecting Indoor Lighting.	
	Total	24

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Physics –I	V. Rajendran	Tata McGraw - Hill
Applied Physics	Arthur Beiser	Tata McGraw - Hill
Engineering Physics	R.K. Gaurand and S.L. Gupta	Dhanpatrai
Phyiscs	Resrie and Holliday	-
Concept of Physics Part-I, II	H.C. Verma	-
Applied science	Roshan Kr. Sinha	Foundation Publishing House

(B)	**CHEMISTRY**	
Unit	Name Of The Topic	Hours

01	**Electrochemistry** Definition of Electrolyte & Conductor, Difference between Metallic &Electrolytic Conduction, Ionisation, Degree of Ionisation & FactorsAffecting Degree of Ionisation, Conductivity of Electrolytes.Definition of Electrochemical Cell, Battery, Charge, Discharge, ClosedCircuit Voltage, Open Circuit Voltage, EMF, Internal Resistance, Separator, Classification of Batteries such as Primary, Secondary &Reserve with Examples.Industrial Application of Electrolysis – Metallic or Protective Factors for Selection of Method of Coating, Process of Electroplating, Electrorefining, Electrometallurgy (Applications of Electroplating),Impregnated Coating or Cementation on Base Metal Steel - CoatingMetal Zn (Sheradizing),Cr (Chomozing), Al (Colorizing), Applications,Advantages& Disadvantages.	5

02	**Non Metallic Engineering Materials** (Plastic, Rubber, Insulators, Refractories, Composite Material, Ceramics) **1. Engineering Plastic:** Special Characteristics & Engineering Applications of Polyamides orNylons, Polycarbonates (Like Lexan, Merlan), Polyurethanes(Like Perlon – U), Silicons, Polyacetals, Teflon, Laminated Plastic, Thermocole, Reinforced Plastic. **2. Ceramics:** Definition, Properties & Engineering Applications, Types – Structural Ceramics, Facing Material, Refractories, Fine Ceramics, Special Ceramics. **3. Refractories:** Definition, Properties, Applications & Uses of Fire Clay, Bricks,		5

	Silica Bricks. **4. Composite Materials:** Definition, Properties, Advantages, Applications & Examples.		
03	**Metals & Alloys** **Metals** – Metallurgy of Iron, Terms Involved in Metallurgy, Indian Resources of Fe, Imp Ores, Extraction, Smelting in Blast Furnace, Chemical Reactions in Blast Furnace, Products of Blast Furnace,their Composition, Application, Commercial Forms of Iron, (Pig Iron /Cast Iron, Wrought or Malleable Steel), their Composition, Properties & Applications, Types of Casting (Chilled Casting, Centrifugal Casting & Malleable Casting), Heat Treatment, Heat Treatment of Cast Iron & Steel. **Alloys** – Definition, Types, Ferrous Alloys – Steel, Composition,Properties & Applications of Plain Carbon Steel (Low Carbon,Medium Carbon, High Carbon & Very Hard Steel) & Alloy Steels, (HeatResisting, Shock Resisting, Magnetic, Stainless, Tool Steel & HSS), Effectof Various Alloying Elements (Cr, W, V, Ni, Mn, Mo, Si) etc. on Steel.Non-Ferrous Alloys – Copper Alloy – Brass, Bronze, Nickel Silver or German Silver, their Composition, Properties & Applications,Aluminium Alloy – Duralumin, Bearing Alloy – Babbitt Metal, Solders –Soft Solder, Brazing Alloy, Tinamann's Solder, Nickel Alloy – MonelMetal, Low Melting Alloys – Woods Metal.		8

04	**Corrosion** Definition, Types, Atmospheric or Chemical Corrosion, Mechanism, Factors Affecting Atmospheric, Corrosion & Immersed Corrosion or Electrochemical Corrosion, Mechanism, Protection of Metals by Purification of Metals, Alloy Formation, Cathode Protection, Controlling the External Conditions & Application of Protective Coatings i.e. Galvanising, Tinning, Metal Spraying, Sherardizing, Electroplating, Metal Clodding, Cementation or Diffusion Method, their Definition, Procedure, Uses, Advantages & Disadvantages, Examples of Non Corrosive Materials, Protection of Corrosion by the Use of Organic Coating Like Paint, Lacquer, Enamels, Emulsion Paints, Special Paints,their Properties & Uses. Special Paints – Heat Resistant, Cellulose Paint, Coaltar Paint, Antifouling Paint their constituents& applications.		6
05	**Lubricant** Lubricant, Types, Lubrication Mechanism by Fluid Film, Baundary, Extreme Pressure, Physical Characteristics of Lubricants Such as Viscosity, Viscosity Index, Oilness, Volatility, Flash & Fire Point, Cloud &Pour Point, Chemical Characteristics such as Acid Value or Neutralization Number, Emulsification, Saponification Value,		3

	Selection of Lubricants for Various Types of Machineries.		
		Total	27

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons
Engineering Chemistry	S.S. Dara	S. Chand Publication
Industrial Chemistry	B.K. Sharma	Goel Publication
Environmental Chemistry & Pollution Control	S.S. Dara	S. Chand Publication
Applied science	Sanjay Kumar, Rahul Kumar	Foundation Publishing House

Course outcomes:
   • Represent physical quantities as scalar and vectors and solve real life relevant problems.
   • Analyse type of motions and apply the formulation to understand banking of roads/railway tracks and conservation of   momentum principle to describe rocket propulsion, recoil of gun etc.
   • Define scientific work, energy and power and their units. Derive relationships for work, energy and

power and solve   related problems.

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CourseCode		PME1201
CourseTitle		Engineering Mechanics
NumberofCredits		4(L:3,T:1,P:0)
Prerequisites		NIL
CourseCategory		PME

Course Objectives :-

- To familiarize students with the key concepts and principles of digital marketing.
- To develop students' ability to create effective digital marketing strategies.
- To enhance students'skills in using digital marketing tools such as Google Analytics and social media platforms.

CONTENTS: THEORY

Unit	Name Of The Topic	Hours

		Force	
01		**a. Fundamentals: - Definitions of** mechanics, statics, dynamics. Engineering Mechanics, body, rigid body, mass, weight, length, time, scalar and vector, fundamental units, derived units, S.I. units. **b. Force**: - Definition of a force, unit force, Newton, S.I. unit of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility. **c. Resolution of a force:** Definition, Method of resolution, Types of component forces, Perpendicular components and Non perpendicular components. **d. Moment of a force: -** Definition, measurement of moment of a force, S. I. unit, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments Varignon's theorem of moment andit's use, couple – definition, S.I. unit, measurement of a couple, properties of couple. **e. Force system: -** Definition, classification of force system according to plane and line of action **f. Composition of Forces**: - Definition, Resultant force, methods of composition of forces, I – Analytical method:– (i) Trigonometric method (law of parallelogram of forces) (ii) Algebraic method (method of resolution),II – Graphical method: - Introduction, space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent, non-concurrent and parallel force system by analytical	12

		and graphical method.	

02	**Equilibrium:** 2.1 Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram. 2.2 Lami's Theorem – statement and explanation, Application of Lami's theorem for solving various engineering problems. 2.3 Equilibrant – Definition, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system. 2.4 Beams – Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, hinged, roller), classification of loads, point load, uniformly distributed load. Reactions of a simply supported and over.	6
03	**Friction:** 3.1 Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction angle of repose and coeff. Of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction. 3.2 Equilibrium of bodies on level plane –external force applied horizontal and inclined up and down. 3.3 Equilibrium of bodies on inclined plane – external forces is applied parallel to the plane, horizontal and incline to inclined plane. 3.4 Ladder friction, Wedge and block.	8
04	**Centroid and Centre Of Gravity:** 4.1 **Centroid:** Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure. 4.2 **Center of gravity:** Definition, center of gravity. Of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids.	8
	Simple Machines: 5.1 Definitions of simple machine, compound machine , load , effort ,mechanical advantage , velocity ratio , input on a machine ,out put of a machine ,efficiency of a machine , expression for mechanical advantage , velocity ratio and efficiency of a	

05	machine. Ideal machine, ideal effort and ideal load, friction in machines, effort lost in friction and frictional load. 5.2 Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self locking machine. 5.3 Study of simple machines : Simple axle and wheel, differential axle and wheel, Weston's differential pulley block, single purchase crab, double purchase crab, worm and worm wheel, geared pulley block, screw jack, pulleys : First, second and third system of pulleys, gear train, hoist mechanism.	10
	Total	48

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Mechanics	Beer-Johnson	Tata McGraw Hill, Delhi
Engineering Mechanics	Basu	Tata McGraw Hill, Delhi
Vector Mechanics for Engineers Vol. - I & II	Joslph F. Shelley	Tata McGraw Hill, Delhi
Engg. Mechanics	Ram Manohar Pandey	Foundation Publishing House

- **Course Outcomes:**
- Students will be able to explain the fundamental concepts and principles of digital marketin g.
- Students will be able to design and implement a comprehensive digital marketing strategy.
- Students will be able to analyze digital marketing metrics and generate performance reports using Google Analytics.

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CourseCode		PME1202
CourseTitle		Engineering Drawing
NumberofCredits		4(L:3,T:1,P:0)
Prerequisites		NIL
CourseCategory		PME

Course Objectives :-

To introduce the students, the techniques of constructing the various types of polygons, curves and scales.

Unit	Name Of The Topic	Hours
01	**Sectional Views.** 1.1 Types of sections 1.2 Conversion of pictorial view into sectional orthographic views (First Angle Projection Method only)	3
02	**Missing Views.** 2.1 Draw missing view from the given Orthographic views - simple components (First Angle Projection Method only)	1

	Isometric Projection 3.1 Conversion of Orthographic Views into Isometric view/projection	3

03	(Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces).	
04	**Projections of Solids.** 4.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other.	2
05	**Sections of Solids.** 5.1 Solids: -Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube. 5.2 Cone, Pyramid and Tetrahedron resting on their base on Horizontal Plane. 5.3 Prism, Cylinder: -a)Axis parallel to both the reference plane b) Resting on their base on HP. 5.4 Section plane inclined to one reference plane and perpendicular to other.	3
06	**Developments of Surfaces.** Developments of Lateral surfaces of cube, prisms, cylinder, pyramids, cone and their applications such as tray, funnel, Chimney, pipe bends etc.	2
07	**Free Hand Sketches** 7.1 Free hand sketches of nuts, bolts, rivets, threads, split pin, foundation bolts,	2
	Total	16

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Engineering Drawing	N.D. Bhatta	Charotkar Publishing House
Engineering Drawing	R.K. Dhawan	S. Chand Co.
Engineering Drawing P.J. Shah	Engineering Drawing P.J. Shah	-
Machine Drawing	N.D. Bhatta	Charotkar Publishing House
Engineering Drawing and Graphics + Auto CAD	K. Venugopal	New Age Publication
Engineering Graphics	K.R. Mohan	Dhanpat Rai and Publication Co.
Machine Drawing	R.K. Dhawan	S. Chand Co.
Engineering Drawing	Dharmendra Kumar	Foundation Publishing House

Course Outcomes:

• To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
• To impart knowledge on the projection of points, lines and plane surfaces
• To improve the visualization skills for better understanding of projection of solids
• To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces

• To make the students understand the viewing perception of a solid object in Isometric and Perspective projections

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CourseCode		PAS1201P
CourseTitle		Communication Skills(Language Lab)
NumberofCredits		1(L:0,T:0,P:1)
Prerequisites		NIL
CourseCategory		PASP

CONTENTS : PRACTICAL

Assignments:

1. Communication Cycle (With The Help Of Diagram)
2. Communication Situations (List Of 5 Communication situations stating the types of Communication
3. Barriers That Hinder A Particular Communication Situation. (State the type of barrier, and how to
overcome them)

4. Developing A Story Or A Paragraph For The Given Topic Sentence.(in a group of 5 – 6
students)
5. Describing Various Equipments.
6. Identifying The Various Sentences With Their Type Of Writing. (e.g. Scientific, Legal, Colloquial etc.)
7. Business Letters
8. Letters Of Suggestion
9. Comparative Time Table Of 2 Students
10. Description Of Two Different Persons.(seeing the picture)
11. Letter To The Librarian, Principal
12. Report Writing

NOTE: The above assignments are suggested to be completed in the prescribed work-book.

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CourseCode		PAS1201P
CourseTitle		Applied Science Lab
NumberofCredits		1(L:0,T:0,P:2)
Prerequisites		NIL
CourseCategory		PASP

CONTENTS:PRACTICAL

List of Experiments (PHYSICS):

1. To represent simple harmonic motion with the help of vertical oscillation of spring and to determine spring constant (K) (Stiffness Constant)

| 2. To determine time period of oscillation of compound bar pendulum and calculate acceleration due |
| to gravity. |
| 3. To determine the velocity of sound by using resonance tube |

| 4. To compare luminous intensities of two luminous bodies by using Bunsen's photometer. |
| 5. To calculate coefficient of absorption for acoustical materials |
| 6. To determine Joule's constant (J) by electric method |
| 7. To determine wavelength of Sodium light by using Newton's rings |

List of Experiments (CHEMISTRY):

| 1. To determine neutralization point of weak acid and weak base by conductivity meter. |
| 2. To determine end point of titration between dil. H2SO4 and BaCl2 using conductivitymeter. |
| 3. To verify Faraday's second law of electrolysis. |
| 4. To determine pH of given solution by using pH paper, universal indicator and pH meter. |
| 5. To determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution using pH meter. |
| 6. To determine percentage of copper from brass iodometrically. |
| 7. To find the rate of corrosion of Al strip in acidic and basic medium graphically. |
| 8. To determine thinner content in paint. |
| 9. To determine acid value of given lubricant. |
| 10. To determine viscosity of given oil by using Ostwald's viscometer. |
| 11. To determine saponification value of given lubricant |

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CourseCode		PME1201P
CourseTitle		Engineering Mechanics
NumberofCredits		1(L:0,T:0,P:2)
Prerequisites		NIL
CourseCategory		PMEP

CONTENTS:PRACTICAL

| Skills to be developed: |
| **1.**Intellectual Skill: A. Calculate the forces on given structure |

B. Interpret the results
2. Motor Skills: A. Handle the equipment carefully
B. Draw graph
Any five experiments from Group A,B and graphical solution in Group C :
Group A:
1) Verify law of polygon of forces

2) Verify law of moments
3) Verification of Lami's theorem
4) Forces in members of a jib crane.
5) Comparison of coefficient of friction of various pair of surfaces and
6) determination of angle of repose
7) Equilibrium of parallel forces – simply supported beam reactions.
8) Experimental location of center of gravity of plane plate of uniform thickness.
Group B:
To find MA, VR, Efficiency, Ideal Effort, Effort lost in friction for various loads and establish
law of machine and calculate maximum efficiency.
Also check the reversibility of a machine (Any five):
1) Differential axle and wheel
2) Weston's differential pulley block
3) Geared pulley block
4) Single purchase crab
5) Double purchase crab
6) Worm and worm wheel
7) Two sheave and three sheave pulley block
8) Screw jack.
Group C:
A 2 Size drawing sheets containing graphical solutions for –
1) Concurrent force system : Two problems
2) Parallel force system : Two problems
3) Reactions of a beam : Two problems

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CourseCode		PME1203P
CourseTitle		Workshop Practice
NumberofCredits		2(L:0,T:0,P:3)
Prerequisites		NIL
CourseCategory		PMEP

CONTENTS:PRACTICAL

S.No.	List Of Practical's
	CARPENTERY SHOP: ⬜⬜Any one composite job from the following involving different joint, turning and planning, surface finishing by emery paper, varnishing etc. like square stool, tea table, center table, chaurang, table lamp bed sofaset, book rack. Cabinet, notice board, shows cases, tables

S.No.	
1	chairs etc. Note: 1] One job of standard size (Saleable article shall be preferred) 2] Batch size should be selected depending on volume of work. 3] Job allotted should comprise of 6-8 hours of actual working 4] Student shall calculate the cost of material and labor cost for their job from the drawing.
2	**WELDING SHOP** ⬜⬜Any one composite job from involving butt joint lap joint welding process, from the following like Grill, door, window frame, waste paper basket, Chappel stand, Corner flower stand chair , table frame (squarepipe 25 mm) cooler frame (folding type) **Note:** 1] One job of standard size (Saleable/marketable article shall be preferred) 2] Batch size should be selected depending on volume of work . 3] Job allotted should comprise of 6-8 hours of actual working operations. 4] Student shall calculate the cost of material and labor required for their job from the drawing.
3	**SMITHY SHOP** ⬜⬜Demonstration of different forging tools and Power Hammer. ⬜⬜Demonstration of different forging processes, likes shaping, caulking fullering, setting down operations etc. ⬜⬜One job like hook peg, flat chisel or any hardware item. ⬜⬜**Note**: 1]One job of standard size (Saleable/marketable article shall be preferred) 2] Job allotted should comprise of 4-6 hours of actual working operations. 3] Student shall calculate the cost of material and labor required for their job from the drawing.
4	**PLUMBING SHOP :** ⬜⬜Demonstration of PVC pipe joint with various fittings. ⬜⬜Exercise for students on preparing actual pipeline layout for G.I. Pipe or PVC pipe. Preparing actual drawing and bill of material. Note:1] One job of standard size (Saleable/marketable article shall be preferred) 2] Batch size should be selected depending on volume of work. 3] Job allotted should comprise of 6-8 hours of actual working 4] Student shall calculate the cost of material and labor cost for their job from the drawing.

5	***SHEET METAL SHOP*** ⬜⬜One composite job from the following: Letter box, Trunk, Grain Container, Water-heater Container, Bucket, Waste Paper Basket, Cooler Tray, Water-draining Channel, etc.(including soldering and riveting) Note: 1] One job of standard size (Saleable/marketable article shall be preferred) K.K.U-DIPLOMA(E.E) Page 39 2] Batch size should be selected depending on volume of work. 3] Job allotted should comprise of 4-6 hours of actual working ions. 4] Student shall calculate the cost of material and labor cost required

	for their job from the drawing.
6	**Demonstration of power tools and practice of utility items.** ⬜⬜Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. ⬜⬜Making of electrical switchboard with 2 sockets and piano buttons and with electrical wiring. ⬜⬜Any other item as per the requirement of college/Deptt./

IIIRD SEMESTER DIPLOMA IN ELECTRICAL ENGINEERING
(Effective from Session 2023-24 Batch)
THEORY

S. No.	Course Code	Course Title	Teaching Scheme			Credit
			Contact Hours per week			
			L	T	P	
1	BS2101	Applied Mathematics	3	0	0	3
2	EEPC2103	Electrical Circuit & Network	2	1	0	3
3	EEPC2105	Electrical Measurement	3	1	0	4

SEMESTER-III
THEORY

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	P1M2101	Applied Mathematics	5	0	0	5
2	PCE2101	Surveying	3	1	0	4
3	PCE2102	Building Construction	3	1	0	4
4	PCE2103	Building Drawing	4	0	0	4
5	PCE2104	Concrete Technology	3	1	0	4

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
6	PCE2101P	Surveying Lab	0	0	2	1
7	PCE2102P	Building Construction Lab	0	0	2	1
8	PCE2103S	Building Drawing Lab	0	0	3	2
9	PCE2104P	Concrete Technology Lab	0	0	3	2
				Total		28

APPLIED MATHEMATICS

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	
P1M2101	5	0	0	5
	-	-	-	

CONTENTS: THEORY

Course Objectives:
- Apply Numerical methods to solve first order ordinary differential equations and Algebraic and Transcendental equation.
- Demonstrate the ability of solving ordinary differential equations and partial differential equations by Laplace transform and Fourier transform.
- Determine the solution of difference equations by use of z transform.
- To learn about some advanced numerical techniques e.g. solving a nonlinear equation, linear system of equations, Interpolation and Approximation techniques.

Unit-1: - INTEGRATION
1.1 Definition of integration as anti-derivative, Integration of standard function.
1.2 Rules of integration (Integrals of sum, difference, scalar multiplication).
1.3 Methods of Integration.
    1.3.1 Integration by substitution
    1.3.2 Integration of rational functions.
    1.3.3 Integration by partial fractions.
    1.3.4 Integration by trigonometric transformation.
    1.3.5 Integration by parts.
1.4 Definite Integration.
    1.4.1 Definition of definite integral.
    1.4.2 Properties of definite integral with simple problems.
1.5 Applications of definite integrals.
    1.5.1 Area under the curve. Area bounded by two curves,
    1.5.2 Volume of revolution.
    1.5.3 Centre of gravity of a rod, plane lamina.
    1.5.4 Moment of Inertia of uniform rod, rectangular lamina
    1.5.5 Theorems of parallel and perpendicular axes.

Unit-2: - DIFFERENTIAL EQUATION
2.1 Definition of differential equation, order and degree of differential equation. Formation of Differential Equation for function containing single constant.
2.2 Solution of differential equations of first order and first degree such as variable separable type, Reducible to Variable separable, Homogeneous, Non homogeneous, Exact, Linear and Bernoulli Equations.
2.3 Applications of Differential equations.
2.3.1 Rectilinear motion (motion under constant and variable acceleration)

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2.3.2 Simple Harmonic Motion.

Unit-3: - PROBABILITY DISTRIBUTION

3.1 Binomial distribution.

3.2 Poisson's distribution.

3.3 Normal distribution

3.4 Simple examples corresponding to production process.

Unit-4: - NUMERICAL METHODS

4.1 Solution of algebraic equations - Bisection method, Regula- falsi method. Newton – Raphson method.

4.2 Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method. Iterative methods - Gauss seidal and Jacobi's methods.

Course outcomes:

At the end of the course, the student will be able to:

- Solve non-linear equations in one variable and system of linear equations using iteration methods.
- Choose appropriate interpolation formulae based on the given data.
- Compute the value of a definite integral using numerical integration techniques.
- Predict the numerical solution of the derivative at a point from the given initial value problem using appropriate numerical method.

Text /Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Mathematics for polytechnic	S. P. Deshpande	Vidyarthi Griha Prakashan, Pune
Calculus: single variable	Robert T. Smith	Tata McGraw Hill
Higher Engineering Mathematics	B. S. Grewal	Khanna Publication, New Dehli
Advanced Mathematics for Engineers and Scientist	Murray R Spiegel	Schaum outline series McGraw Hill
Applied Mathematics	Rajendra Pal, S.N. Malik	Foundation Publishing
Numerical methods for Engg. 4th ed.	Chapra	Tata McGraw Hill

SURVEYING

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	
PCE2101	3	1	0	4
	-	-	-	

CONTENTS: THEORY

Course Objectives:

Following are the objectives of this course:

- To understand types of surveying work required.
- To know the types of method and equipment to be used for different surveys.
- To know the use and operational details of various surveying equipment.

Unit-1: - INTRODUCTION

1.1 Definition. Objects of Surveying, Principles of Surveying. Uses of Survey.

 1.2 Classification of Surveying

        1.2.1 Primary – Plain, Geodetic.

        1.2.2 Secondary – Based on Instruments, Method, Object, Nature of Field.

Unit-2: - CHAIN & CROSS STAFF SURVEY

2.1 Principle of Chain Survey. Study and use of Instruments for linear measurements – Chain, Tape, Ranging Rod, Arrows, Pegs, Cross Staff, Optical Square and Line Ranger.

2.2 Ranging –Direct and Indirect ranging, Chaining – Plain and Sloping grounds. Chain Triangulation Survey station and their Selections, Survey lines, Check lines, Tie lines, Base line. Taking offsets long and short offset, Degree of offset, Obstacles in chaining.

2.3 Chain & Cross staff Survey for finding area of a field (Numerical Problems). Errors in chain surveying & applying corrections for Chain & Tape (Numerical Problems). Conventional signs related to survey.

Unit-3: - COMPASS SURVEY

3.1 Principle of Compass Survey, Bearing of Lines – Meridian –True, Magnetic, and Arbitrary. Bearing–Fore Bearing, back bearing, Whole circle bearing, Quadrantal bearing system and reduced bearing, Conversion of bearings, finding included angles from bearings.

3.2 Prismatic Compass – Component, Construction and use.

3.3 Local Attraction, Causes, Precautions to be taken to avoid and correction of bearings affected due to Local attraction, Calculation of included angles.

3.4 Traversing – Open traverse, Closed traverse, Check on open and closed traverse. Graphical adjustment for closing error.

3.5 Numerical Problems on Calculation of bearings angles and Local attraction.

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Unit-4: - LEVELLING

4.1 Definitions – Level surface, Level line, Horizontal line, Vertical line, Datum surface, reduced level, Bench mark and its types.

4.2 Dumpy level – Components, Construction, Line of sight, Line of collimation, Bubble tube axis, Levelling Staff – Telescopic and folding type. Foresight, Back sight, Intermediate sight, Change point, Height of Collimation. Fundamental axes and their relationship.

4.3 Recording in level book. Temporary adjustments of Dumpy level.

4.4 Method of Reduction of Levels – Height of Instrument, Method of Rise and fall method. Arithmetical Checks, Numerical Problems, Computation of Missing Readings.

4.5 Classifications Of Levelling - Simple, Differential, Profile, Cross Sectional, Fly And Check Levelling.

4.6 Study and Use of Tilting Level & Auto Level.

4.7 Sources And Errors In Levelling, Precautions And Difficulties Faced In Levelling.

Unit-5: - CONTOURING

5.1 Definitions – Contour, Contour Interval, Horizontal Equivalent.

5.2 Characteristics of Contours & Method Of Locating Contours.

- Interpolation of Contours. Establishing Grade Contours.

5.3 Uses of Contour Maps.

- Interpretation of Typical Contour Sheets

Unit-6: - AREA AND VOLUME MEASUREMENTS

6.1 Construction and Use of Polar Planimeter for Measurement of Area and Simple Numerical Problems.

6.2 Study and Use of Digital Planimeter.

6.3 Concept of Computation of Volume By Trapezoidal And Prismoidal Formulae.
   (No Numerical Problems)

Course outcomes:

After completing this course, student will be able to:

- Select the type of survey required for given situation.
- Compute area of open field using chain, tape and cross staff.
- Conduct traversing in the field using chain and compass.
- Use leveling instruments to determine reduced level for preparation of contour maps Use digital planimeter to calculate the areas.

Text /Reference Books:

Titles Of The Book	Name Of Authors	Name Of The Publisher
Surveying And Levelling	N.N.BASAK	Tata Mc Graw-Hill
Surveying And Levelling Part I And II	T .P. Kanetkar & S. V, Kulkarni	Pune Vidhyarthi Griha Prakashan
Surveying And Levelling Vol. I And II	Dr. B. C. Punmiya	Laxmi Plublication
Surveying And Levelling Vol. I And II	S. K. Duggal	Tata Mc Graw-Hill
Plane Surveying	M.Chandra	New Age International Publishers

BUILDING CONSTRUCTION

Subject Code	Theory			Credits
	No.Of Period Per Week			
	L	T	P	4
PCE2102	3	1	0	
	-	-	-	

CONTENTS: THEORY

Course Objectives:

Following are the objectives of this course:

- Develop knowledge of material science and behavior of various building materials used in construction.
- Identify the construction materials required for the assigned work.
- Provide procedural knowledge of the simple testing methods of cement, lime and concrete etc.
- List the requirements and different types of stairs

Unit-1: - BUILDING COMPONENTS AND MATERIALS

1.1 Building Components and Types Of Structure

- Building Components & Their Function.
- Substructure – Foundation, Plinth.
- Superstructure – Walls, Sill, Lintel, Doors & Windows, Floor, Roof, Parapet, Beams, Columns.
- Types Of Structures – Load Bearing Structures, Framed Structures, Composite Structures.

1.2 Masonry Materials

- Building Stones- Classification of Rocks, Requirement Of Good Building Stone, Dressing Of Stones, Quarrying Of Stones, Artificial or Cast Stones.
- Bricks– Conventional Bricks, Standard Bricks Composition Of Clay Brick, Strength of Bricks, Proportions of Burnt Clay Bricks, Testing Of Bricks, Special Bricks, Hollow Blocks, Fly Ash Bricks.
- Mortars – Classifications, Lime Mortar, Cement Mortar, Special Mortars. Functions of Mortar, Proportions, Properties of Mortar and Tests for Mortar.

1.3 Timber Based Material

- Use of Timber, Characteristics Of Good Timber, Defects In Timber, Plywood, Particle Board Veneer, Sun Mica , Fore Mica, Artificial Timber, Rubber Wood.

1.4 Miscellaneous Materials

- Glass, Plastic, Fibers, Aluminum, Steel , Galvanized Iron, Asphalt Bitumen Etc .Micro Silica, PVC, CPVC, PPF.
- Waterproofing And Termite Proofing Materials, Admixtures In Concrete, Bonding Agents, Epoxy Resins, Polishing Materials Etc

Unit-2: - Construction of Substructure

2.1 Job Layout
- Site Clearance, Preparing Job Layout, Layout for Load Bearing Structure and Framed Structure by Center Line and Face Line Method, Precautions While Marking Layout on Ground.

2.2 Earthwork
- Excavation for Foundation, Timbering and Strutting Earthwork for Embankment Material for Plinth Filling. Tools and Plants Used For Excavation and Earthwork.

2.3 Foundation
- Types Of Foundation – Open Foundations, Shallow Foundation, Stepped Foundation, Isolated And Combined Column Footing, Raft Foundation, Deep Foundation And Pile Foundation Pumping Method Of Dewatering, Cofferdams.
- Bearing Capacity of Foundation Soil, Under Reamed Pile Foundation.

Unit-3: - Construction of Superstructure
3.1 Stone Masonry
- Terms Used In Stone Masonry – Facing, Backing, Hearting, Through Stone, Corner Stone.
- Uncoursed Rubble Masonry, Coursed Rubble Masonry, Point To Be Observed In Construction Of Stone Masonry, Mortars For Stone Masonry, Tools And Plants Used For Stone Masonry, Col-Grout Masonry.

3.2 Brick Masonry
- Common Terms Used In Brick Masonry, Requirements Of Good Brickwork, and Bonds In Brick Masonry, English, Flemish, Stretcher And Header Bonds Only.
- Brick Laying, Line Level And Plumb Of Brickwork, Striking And Raking Of Joints, Lead And Lift, Precautions In Brick Masonry, Tools And Plants Use In Brick Masonry.
- Comparison between Brick and Stone Masonry. Hollow Concrete Block Masonry, Composite Masonry ,
- Cavity Wall- Purpose and Construction.

3.3 Doors and Windows
- Doors -Components And Construction Of Paneled Doors, Battened Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors. Sizes of Door.
- Windows - Component And Construction Of Fully Paneled, Partly Paneled And Glazed, Glazed Wooden, Steel, Aluminum Windows, Sliding Windows, Louvered Window, Ventilators, Cement Grills.
- Protective Treatment For Doors And Windows, Fixtures And
- Fastenings for Doors and Window.
- Sill, Lintel And Weather Shed - Functions, Types And Construction.

3.4 Vertical Communication
- Means Of Vertical Communication – Stair Case, Elevator Or Of Good Staircase, Types Of Staircase, Fabricated Stair.

3.5 Scaffolding and Shoring
- Purpose, Types of Scaffolding, Process of Erection and Dismantling. Purpose and Types of Shoring, Underpinning, Safety Precautions.

Unit-4: - Building Finishes

4.1 Floors and Roofs

- Floor Finishes- Shahabad, Kota, Marble, Granite ,Kadappa, Ceramic Tiles Vitrified , Mosaic Tiles, Chequerred Tiles, Glazed Tiles ,Pavement Blocks, Concrete Floors, Tremix Floor, Skirting And Dado.
- Process Of Laying- Process Of Laying And Construction, Finishing And Polishing Of Floors.
- Roofing Materials – Ac Sheets, G.I. Sheets, Plastic Sheets, Fibre Sheets, Mangalore Tiles Etc. Steel Trusses. R.C.C. Slab

4.2 Wall Finishes

- Plastering – Necessity of Plastering, Single Coat Plaster Double Coat Plaster, Neeru Finishing and Pop, Special Plasters Stucco Plaster, Plaster Board and Wall Claddings.
- Precaution to Be Taken While Plastering.
- Defects in Plaster.
- Pointing – Necessity and Procedure of Pointing.
- Painting – Necessity, Surface Preparation, Method of Application, Selecting Suitable Painting Material, White Wash and Colour Wash.

Unit-5: - Building Maintenance

5.1 Cracks

- Causes and Types of Cracks, Identification and Repair of Cracks. Guniting and Grouting, Use Of Epoxy And Crack Fills.

5.2 Settlement

- Settlement --Causes and Remedial Measures
- Plinth Protection – Necessity And Materials Used.

5.3 Demolition

- Necessity, Method Of Demolition-Hand Demolition, Machine Demolition, Controlled Blasting Demolition, Precautions During Demolition.

5.4 Rebaring Techniques

- Necessity And Equipment For Rebaring Techniques

Course outcomes:

After completing this course, student will be able to:

- Predict the properties of building stones and its classifications.
- Understand the concept of various methods of manufacture of bricks.
- Identify rock using basic geological classification systems.
- Obtain differentiate the fine aggregates and coarse aggregates under various views.
- Explain various types of cements and their applications in construction in various field and laboratory tests on cement.
- Analyze the importance of mineral and chemical admixtures, requirements of the concrete in construction.
- Explain different types of lintel, arches and the materials which are commonly used for construction.
- Explain the suitability of floors in buildings like mosaic flooring, terrazzo flooring, rubber flooring, asphalt flooring.

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Building materials	S. K. Duggal	NEW AGE INTERNATIONAL PUBLISHERS
Construction materials	D.N. Ghose	TATA MC GRAW-HILL
Building Construction	S.P.Arora and Bindra	Dhanpat Rai Publication
Building Construction	Sushil Kumar	Standard Publication
Building Construction	B.C punmia	Laxmi Plublication

BUILDING DRAWING

Subject Code PCE2103	Theory			Credits
	No. Of Period Per Week			
	L	T	P	4
	4	0	0	
	-	-	-	

CONTENTS: THEORY

Course Objectives:

- These students will able to understand basic principles of building design and planning.
- They will explore building drawing as a way of discovering and developing ideas for designing residential, commercial and public buildings.
- The student develops basic drawing skills; create multilayer architectural and working drawing drawings.

Unit-1: - Conventions

1.1 Conventions as per IS: 962-1967 and other practices

1.2 Types of Lines

- Visible line, Centerline, Hidden line, Section Line, Dimension line, Extension line, Pointers, Arrow heads or dots.

1.3 Symbols

- Materials used in construction, building components

1.4 Reading of available ammonia prints of residential buildings

Unit-2: - Planning Of Building

2.1 Principles of planning of Residential and Public building.

2.2 Space requirements and norms for various units of Residential and Public building.

- Rules and byelaws of local governing authorities for construction.

2.3 Drawing of line plans for Residential and Public building

Unit-3: - Types of Drawing

3.1 Development of line plan

3.2 Elevation

3.3 Section

3.4 Site plan

3.5 Location Plan

3.6 Foundation plan

3.7 Area statement and other details.

3.8 Measured Drawing and its significance

3.9 Submission Drawing and Working Drawing

Unit-4: - Perspective Drawing

4.1 Definition, Necessity, Principles of Perspective Drawing,

- Terms used in perspective drawing.

4.2 Two point perspective view of a small object like pedestal, step block, small single storied building With flat roof etc.

Course Outcomes:

- After completion of this students will able to understand basic principles of building design and planning.
- They will explore building drawing as a way of discovering and developing ideas for designing residential, commercial and public buildings.
- The student develops basic drawing skills; create multilayer architectural and working drawing drawings.

Text /Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Text Book of Building Drawing	Shah, Kale, Patki	
Elements of Building Drawing	D. M. Mahajan	Pune Vidyarthi Griha Prakashan
Civil Engineering Drawing	Malik & Mayo	New Asian Publishers New Delhi
Civil Engg. Drawing & House Planning	B.P. Verma	Khanna Publishers, Delhi
Building Drawing	Nagrajan	Foundation Publishing

CONCRETE TECHNOLOGY

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	
PCE2104	3	1	0	4
	-	-	-	

CONTENTS: THEORY

Course Objectives:

- To understand the principles of concrete mix design, properties of fresh and hardened concrete, and the various techniques involved in the production, placement, and curing of concrete.
- Designing concrete mixes, understanding admixtures, testing concrete for strength, durability, and workability.

Unit-1: - Properties of Cement:

1.1 Physical properties of Ordinary Portland cement (OPC), determination and test on OPC, Hydration of Cement, physical properties of cement – fineness, standard consistency, initial & final setting times, Compressive strength & soundness, different grades of opc 33, 43, 53 & their specification of physical Properties as per relevant I. S. codes. Adulteration of cement (field test), storing cement at site, effect Of storage of cement on properties of cement / concrete.

1.2 Types of Cement

- Physical properties, specifications as per relevant IS codes & field application of the following types of cement
- Rapid hardening cement
- Low heat cement
- Pozzolana Portland cement
- Sulphate resisting cement
- Blast furnace slag cement
- White cement

Unit-2: - Properties of Aggregates:

2.1 Properties of fine aggregates:

- Concept of size, shape, surface texture, strength, specific gravity, Bulk density, water absorption, surface moisture, soundness, bulking impurities.

2.2 Determination of fineness modulus & grading zone of sand by sieve analysis, determination of Silt Content in sand & their specification as per IS 383

2.3 Bulking of sand, phenomenon of bulking, and its effect on concrete mix proportion.

2.4 Properties of coarse aggregates:

- Concept of size, shape, surface texture, water absorption, soundness, specific gravity & bulk density.

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2.5 Determination of fineness modulus of coarse aggregate by sieve analysis, grading of Coarse Aggregates

2.6 Determination of crushing value, impact value & abrasion value of coarse aggregate, flakiness index & Elongation index of coarse aggregate and their specification.

Unit-3: - Properties of Concrete:

3.1 Introduction to concrete -

- Definition of concrete, necessity of supervision for concreting operation, different grades of concrete (ordinary concrete, standard concrete & high strength concrete as per provisions of IS 456- 2000), minimum grade of concrete for different exposure conditions, minimum grade of concrete for R.C.C., water retaining structure & in sea water construction, durability of concrete.

3.2 Water cement ratio:-

- Definition of w/c ratio, Duff Abraham w/c law, significance of w/c ratio, selection of w/c ratio for different grades of concrete prepared from different grades of OPC as per graphs specified in IS 10262 -1982, maximum w/c ratio for different grades of concrete for different exposure conditions.

3.3 Properties of fresh concrete:-

- Definition of workability, factors affecting workability of concrete. Determination of workability of concrete by slump cone test, compaction factor test, vee bee consistometer & flow table tests. Range values of workability requirement for different types of concrete works, cohesiveness, segregation, harshness, bleeding.

3.4 Properties of hardened concrete:-

- Definition of compressive strength, durability, impermeability, elastic properties of concrete, modulus of elasticity of concrete. Creep, factors affecting creep, shrinkage, factors affecting Shrinkage

3.5 CONCRETE MIX DESIGN:-

- Objectives of mix design, list of different method of mix design, study of mix design procedure by I.S. method as per I.S. 10262-1982, determination of design mix proportion by mass for M 20 grade of concrete using I.S. Method for given data (such as grading zone of sand, proportion of 20 mm & 10 mm metals, specific gravities of cement, sand & aggregate , water absorption of sand & aggregate, compacting factor and exposure condition).

3.6 TESTING OF CONCRETE:-

- Significance of testing, determination of compressive strength of concrete cubes at different ages, interpretation & co-relation of test results.

3.7 NON- DESTRUCTIVE TESTING OF CONCRETE:-

- Importance of NDT, methods of NDT - rebound hammer test & ultrasonic pulse velocity test, working principle of rebound hammer and factor affecting the rebound index, specification for deciding the quality of concrete by ultrasonic pulse velocity as per I.S. 13311 (part 1 & 2).

- Determination of rebound index & compressive strength of concrete by rebound hammer test as per I.S. 13311, determination of quality of concrete by ultrasonic pulse velocity test.

Unit-4: - Quality Control of Concrete:

4.1 Batching, Different Types of Mixers & Vibrators Volume & weight batching, volume batching for nominal mixes & weight batching for design mix concrete, types of mixers (tilting & non-tilting type) Different types of vibrators - needle vibrator, surface vibrator, table vibrator, principle & application of each type of vibrator.

4.2 Formwork:-
- Formwork for concreting, different types of formworks for different works such as beams, slabs, columns, well foundation, materials used for formwork, requirement of good formwork, stripping time for the removal of formwork as per I.S. 456- 2000 provisions for different structural members.

4.3 Transportation, placing, compaction & finishing of concrete:-
- Modes of transportation of concrete , precautions to be taken during transportation and placing of concrete in formwork compaction of concrete, methods of compaction, care to be taken during compaction, purpose of finishing, types of finishing & methods of application (surface treatment, expose aggregate finish, applied finish, coloured finish), requirement of good finish.

4.4 Curing of concrete:-
- Definition of curing, necessity of curing, different methods of curing and their application (spraying water, membrane curing, steam curing, curing by infra red radiations, curing by wet gunny bags, ponding methods).

4.5 Waterproofing of concrete & joints in concrete construction:-
- Importance & need of waterproofing, methods of waterproofing & materials used for waterproofing, types of joints, joining old & new concrete, methods of joining, materials used for filling joints.

Unit-5: - Extreme weather concreting & chemical Admixture in concrete:-

5.1 Extreme weather concreting:-
- Effect of cold weather on concrete, effect of hot weather on concrete, precautions to be taken while concreting in hot & cold weather condition.

5.2 Chemical admixture in concrete:-
- Properties & application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixture, air entraining admixture & super plasticizers

Unit-6: - Properties of Special Concrete:
- Properties, Advantages & Limitation of the following types of Special concrete
- Ready mix Concrete
- Reinforced Concrete

- Prestressed Concrete
- Fiber Reinforced Concrete
- Precast Concrete
- High performance Concrete.

Course Outcomes:
- Able to designing concrete mixes, understanding admixtures, testing concrete for strength, Durability and workability.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Concrete Technology	M. L. Gambhir	Tata Mc Graw . Hill Publishing Co. Ltd. New Delhi
Concrete technology	A. M. Neyille & J J Brooks	Pearson Education (Singapore) Pvt. Ltd. New Delhi
Concrete technology	M. S. Shetty	S. Chand Publication
Text book of Concrete technology	P. D. Kulkarni	M. H. Ghosh and Phull publication
Concrete Technology	Gopalkrishnan	Foundation Publishing

SURVEYING LAB

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	
PCE2101P	0	0	2	1
	-	-	-	

CONTENTS: PRACTICAL

Intellectual skills:-

- ➢ Identify the different instruments for linear measurement and levelling.
- ➢ Record and observing necessary observation with the survey instruments
- ➢ Classify and discriminating various types of survey instruments.
- ➢ Identify the errors of the survey instruments.

Motor skills:-

- ➢ Measure distances, bearings and finding reduced levels with survey instruments.
- ➢ Prepare drawing using survey data.
- ➢ Prepare contour map of a given terrain/topography.
- ➢ Measure area of an irregular shape figure with planimeter.

Instructions:-

- ➢ Group size for survey practical work should be maximum 6 students.
- ➢ Each student from a group should handle the instrument independently to understand the
- ➢ Function of different components and use of the instrument.
- ➢ Drawing, plotting should be considered as part of practical.
- ➢ One full day per project is required for carrying out project work.

Practical shall consist of record of all practical and projects in field book and drawing of Project work on full imperial size drawing sheets.

- ➢ Measurement of distances with chain & tape on ground with direct or indirect ranging.
- ➢ Construction and use of optical square and open cross staff for setting out perpendicular and running a survey line for locating details.
- ➢ Measurement of area by chain and cross staff survey.
- ➢ Use of prismatic compass and observing fore bearing and back bearing.
- ➢ Measuring fore bearing and back bearing of 5-6 side closed polygon. Identifying stations affected by local attraction and calculation of corrected F.B. & B.B.
- ➢ Measuring fore bearing and back bearing for an open traverse (5 to 6 sided). Calculate direct angles between successive lines.
- ➢ Use of dumpy level, temporary adjustments and taking reading on levelling staff. Recording readings in field book.
- ➢ Differential levelling practice, reduction of level by H.I method.
- ➢ Differential levelling practice, reduction of level by rise & fall method.
- ➢ Carrying bench mark from one point to another point about 200 m by fly levelling with tilting level

➢ Use of auto level and taking observation.

BUILDING CONSTRUCTION LAB

	Theory			Credits
	No.Of Period Per Week			
Subject Code	**L**	**T**	**P**	
PCE2102P	**0**	**0**	**2**	**1**
	-	-	-	

Contents: Practical

Skills To Be Developed:-

1. Intellectual Skills: - Students Will Be Able To

- Identify Components Of A Building.
- Differentiate And Identify Types Of Building Materials.
- Select Appropriate Material For Building Construction.
- Supervise The Building Construction Activities.

2. Motor Skills: - Students Will Be Able To.

- Mark Layout of Building on the Ground.
- Check and Mark Various Levels in Building.

List of Practical's:

- Preparing Foundation Plan and Marking on Ground Layout of Load Bearing Structure by Face Line Method from the Given Plan of the Building.
- Preparing Foundations Plan and Marking on Ground Layout of Framed Structure by Face Line Method from the Given Plan of the Building.
- Checking and Transferring Line and Level of Plinth, Sill, Lintel and Flooring Slab Level of a Building And Writing Report Of The Process.
- Checking Verticality (Plumb Line) Of Formwork for Column, Beam and Wall at Construction Site and Writing Report of the Process.
- Laying and Constructing the Process of Construction of Brickwork and Report Writing Of the Process.
- Observing The Process Of Painting In Residential / Public Building And Writing A Report With Reference To Process And Type Of Paint Selected.
- Observing and Writing Report of the Process of Plastering.
- Observing and Writing Report of the Process of Water Proofing Of Terrace or Basement.
- Observing The Models, Specimen Of Building Materials Kept In The Model Room For Few Building Items And Writing A Report For Any Five Models/Materials.

CONCRETE TECHNOLOGY LAB

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	
PCE2104P	0	0	2	1
	-	-	-	

CONTENTS: PRACTICAL

Skill to be developed:

Intellectual Skills:

➢ Analyze the given data

➢ Select proper method for analysis

➢ Interpret the results

Motor Skills:

➢ Measure the quantities accurately

➢ Handle instruments properly

Consist of eight experiments consists of GROUP I & GROUP II.

Group I– Physical tests on ordinary Portland cement (any four)

➢ Determination of fineness of cement preferably by Blaine's air permeability apparatus or by sieving.

➢ Determination of standard consistency of OPC

➢ Determination of initial & final setting times of OPC.

➢ Determination of compressive strength of ordinary Portland cement

➢ Determination of soundness of OPC.

Group II – Tests on fine & coarse aggregates (any four)

➢ Determination of silt content in sand by volume / weight

➢ Determination of maximum % of bulking of sand

➢ Determination of aggregate impact value.

➢ Determination of aggregate abrasion value.

➢ Determination of aggregate crushing value.

➢ Determination of bulk density & water absorption, fine & coarse aggregated.

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BUILDING DRAWING LAB

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	
PCE2103S	0	0	2	1
	-	-	-	

Contents: Sessional

Skill to be developed:

Intellectual Skills:

- ➤ Read and interpret the building drawings.
- ➤ Plan residential and public buildings.
- ➤ Apply the building rules regulation and byelaws.

Motor Skills:

- ➤ Prepare line plans of residential and public buildings.
- ➤ Prepare detailed plans, elevation, section and other working drawings for the buildings.
- ➤ Drawing various types of lines, lettering and symbols of materials, doors and windows etc. used in construction on full imperical size drawing sheet.
- ➤ Drawing the lines plans of following buildings on full imperical size graph paper.
- ➤ Residential building (Min. three rooms)
- ➤ Public building – School building, primary health centre/ hospital building, bank, post office, hostel building etc. Measured drawing of an existing residential building (load bearing/framed structure type), showing plan, elevation, sections, construction notes, schedule of openings, site plan, area statement etc.
- ➤ Working drawing of above drawing sheet preferably one plan, section through stair case to scale 1:50.

SEMESTER-IV
THEORY

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PCE2201	Advance Surveying	3	1	0	4
2	PCE2202	Mechanics of Structures	3	1	0	4
3	PCE2203	Soil Mechanics	3	1	0	4
4	PCE2204	Transportation Engineering	4	0	0	4
5	PCE2205	Hydraulics	3	1	0	4

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
6	PCE2201P	Advance Surveying Lab	0	0	4	2
7	PCE2202P	Mechanics of Structures Lab	0	0	3	2
8	PCE2203P	Soil mechanics Lab	0	0	3	2
9	PCE2205P	Hydraulics Lab	0	0	4	2
			Total			28

ADVANCE SURVEYING

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	5
PEE2201	3	0	4	

CONTENTS: THEORY
Course Objectives:

- Draw the plan of the given building using Plane table survey.
- Measure the angle between two given stations using Theodolite.
- Determine the reduced level of the given point using Tachometer.
- Use Total Station instrument for the given purpose in the given situation.
- Locate coordinates of stations on ground using GPS.

Unit-1: - Plane Table Survey

1.1 Principles of plane table survey. Accessories required
1.2 Setting out of plane table, Leveling, Centering and orientation.
1.3 Methods of plane table surveying – Radiation, Intersection, And Traversing.
1.4 Merits and Demerits of plane table Surveying. Situations where plane table survey is used.
1.5 Use of Telescopic Alidade.

Unit-2: - Theodolite Survey

2.1 Components of Transit Theodolite and Their functions. Technical terms used. Temporary Adjustments of Transit Theodolite. Swinging the telescope, Transiting, Changing the face.
2.2 Measurement of Horizontal angle, method of Repetition, Errors eliminated by method of Repetition.
2.3 Measurement of Deflection angle.
2.4 Measurement of Vertical angle.
2.5 Measurement of magnetic bearing of a line by Theodolite.
2.6 Prolonging a Straight line.
2.7 Sources of errors in Theodolite Surveying.
2.8 Permanent adjustment of transit Theodolite (only relationship of different axes of Theodolite.).
2.9 Traversing with Theodolite – Method of included angles, locating details, checks in closed Traverse, Calculation of Bearings from angles.
2.10 Traverse Computation - Latitude, Departure Consecutive Co-ordinates error of Closure, Distribution of an angular Error, balancing the traverse by Bowditch rule and Transit Rule, Gale's traverse table .simple problems on above topic

Unit-3: - Tachometric Survey

3.1 Principle of Tacheometry.
3.2 Essential requirements of Tachometer.
3.3 Use of Theodolite as a Tacheometer with staff held in vertical and fixed hair method (No Derivation).
3.4 Determination of tacheometric constants, simple numerical problems on above topics. Curves

Unit-4: - Curves

4.1 Types of curves used in road and railway alignments. Notations of simple circular curve. Designation of Curve by radius and degree of curves.
4.2 Method of Setting out curve by offset from Long chord method and Rankine's method of Deflection Angles. Simple Numerical problems on above topics

Unit-5: - Advanced Survey Equipment
5.1 Construction and use of one second Micro Optic Theodolite, Electronic Digital Theodolite. Features of Electronic Theodolite
5.2 Principle of E.D.M, Components of E.D.M and their functions, use of E.D.M.
5.3 Total station Aerial Survey and remote sensing

Unit-6: - Aerial Survey and Remote sensing
6.1 Aerial Survey Introductions, definition, Aerial photograph.
6.2 Remote Sensing – Introduction, Electro-Magnetic Energy, Remote sensing system- Passive System, Active system. Applications – mineral, land use / Land cover, Natural Hazards and Environmental Engineering system.

Course Outcomes:

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

- Draw the plan of the given building using Plane table survey.
- Measure the angle between two given stations using Theodolite.
- Determine the reduced level of the given point using Tachometer.
- Use Total Station instrument for the given purpose in the given situation.
- Locate coordinates of stations on ground using GPS.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Surveying and Levelling	N N Basak	Tata Mc Graw-Hill
Surveying and Levelling Part I and II	T .P. Kanetkar & S. V, Kulkarni	PUNE VIDHYARTHI GRIHA Prakashan
Surveying and Levelling Vol. I and II	Dr. B. C. Punmiya	Laxmi Publication
Text book of Surveying	S.K.Husain, M.S. Nagaraj	S. Chand and company
Surveying and Levelling Vol. I and II	S. K. Duggal	TATA MC GRAW-HILL
Plane Surveying	A.M.Chandra	NEW AGE INTERNATIONAL

MECHANICS OF STRUCTURES

Subject Code	Theory			Credits
PCE2202	No. Of Period Per Week			
	L	T	P	5
	4	0	2	
	-	-	-	

Course Objectives:
- Develop an understanding of fundamental concepts of stress, strain, and material behavior Under different types of loading.
- Analyze internal forces and moments in structural elements such as beams, columns, and Trusses.
- Apply principles of mechanics to determine deflections and stability of structures.
- Explore the effects of combined loading on structural members for real-world engineering Problems.
- Foster problem-solving skills for designing safe and efficient structures in accordance with engineering standards.

Unit-1: - stress & Strain
1.1 Definition of rigid body, plastic body, mechanical properties of metal such as elasticity & Elastic limit.
1.2 Definition of stress, strain, modulus of elasticity, S. I. Unit Classification of stress, strain, Sign Convention. Stress, strain curve for mild steel and HYSD bar, yield stress/ proof stress, Ultimate stress, breaking stress and Percentage elongation.
1.3 Deformation of body due to axial load. Deformation of a Body subjected to axial forces. Deformation of body of stepped c/s due to axial load, max. Stress and min. stress induced. Stresses in bars of composite section & Deformation.
1.4 Shear stress, shear strain & modulus of rigidity, complementary Shear stress, state of simple Shear, punching shear.

Unit-2: - Elastic Constants & Principal Stresses
2.1 Definition of lateral strain, Poisson's ratio, Change in lateral dimensions
2.2 Volumetric strain due to uni-axial force and change in volume
2.3 Biaxial and tri-axial stresses and volumetric strain & change in volume
2.4 Definition of bulk modulus, volumetric strain.
2.5 Relation between modulus of elasticity, modulus of rigidity and bulk modulus.
2.6 Definition of principal planes & principal stresses
2.7 Principal planes & stress due to bi-axial stress system & due To state of simple shear. (Analytical method only)

Unit-3: - Shear Force and Bending Moment:
3.1 Types of beams - cantilever, simply supported, fixed and continuous beams, types of loading- Point load, uniformly distributed load, support reactions for determinate structures

3.2 Concept of shear force and bending moment, sign convention. Relation between bending

Moment, shear force and rate of loading
3.3 Shear force and bending moment diagrams for simply supported beams, overhanging beams
And cantilever subjected to point loads, UDL and couples, point of contra flexure

Unit-4: - Moment Of Inertia:
4.1 Concept of moment of inertia M.I of plane areas such as rectangle, triangle, circle, semicircle
And quarter circle
4.2 Parallel axis and perpendicular axis theorem M.I of composite sections, built up sections,
Symmetrical and unsymmetrical sections, radius of gyration & polar moment of inertia

Unit-5: - Stresses in Beams:
5.1 Bending Stresses in Beams: Concept of pure bending, theory of simple bending, assumptions
In theory of bending, neutral axis, bending stresses and their nature, bending stress
Distribution diagram, moment of resistance.
5.2 Application of theory of bending to symmetrical and unsymmetrical sections.
5.3 Shear stresses in beams: Shear stress equation, meaning of Terms in equation, shear stress
Distribution for rectangular, hollow rectangular, circular sections and hollow circular Sections
5.4 Relation between max. Shear stress and average shear stress.

Unit-6: - Analysis of Trusses
6.1 Definition frames, classification of frames, perfect, imperfect, Redundant and deficient frame,
Relation between members and joints, assumption in analysis. Method of joint, method of
Section and graphical method to find nature of forces

Unit-7: - Strain Energy
7.1 Types of loading – gradual, suddenly applied load & Impact load
7.2 Definition of strain energy, modulus of resilience and proof resilience.
7.3 Comparison of stresses due to gradual load, sudden load and Impact load

Course Outcomes:
After completion of the course, the students will be able to-
- Articulate practical applications of moment of inertia of symmetrical and unsymmetrical structuralsections.
- Interpret shear force and bending moment diagrams for various types of determinate beams and loadingconditions.
- Determine the bending and shear stresses in beams under different loading conditions.
- Analyze the given truss using analytical methods.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Strength of Materials	F. L. Singer	Harper& Row Publishers
Strength of Materials	R. S. Khurmi	S. Chand & Company Delhi
Mechanics of Structures volume –I & II	S. B. Junnarkar	Charotar Publishing House, Anand
Mechanics of Structures	Aakash Verma	Foundation Publishing

Soil Mechanics

	Theory			Credits
	No. Of Period Per Week			
Subject Code	**L**	**T**	**P**	**5**
PCE2203	**4**	**0**	**2**	

Course Objectives:

- To understand the fundamental properties and behaviors of soil as an engineering material.
- To analyze the physical and mechanical characteristics of soil, such as permeability,
- Compaction, and strength.
- To study soil classification systems for effective design and construction applications.
- To comprehend the principles of soil consolidation and settlement analysis.
- To apply theoretical knowledge to solve geotechnical engineering problems.

CONTENTS: THEORY

Unit-1: - Overview Geotechnical Engineering

1.1 IS definition of soil?

1.2 Importance of soil in Civil engineering as construction material in Civil Engineering Structures, As Foundation bed for structures

1.3 Field application of geotechnical engineering foundation design, pavement design, and design Of earth Retaining Structures, design of earthen dams (brief ideas only)

Unit-2: - Physical Properties of Soil

2.1 Soil as a three phase system

2.2 Water content, Determination of water content by oven Drying method as per IS code

2.3 Void ratio, porosity and degree of saturation, density index

2.4 Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated Unit Weight, Submerged unit weight

2.5 Determination of bulk unit weight and dry unit weight by core cutter method and sand Replacement method As per IS code

2.6 Specific gravity, determination of specific gravity by pycnometer.

2.7 Consistency of soil, stages of consistency, Atterberg's limits of consistency viz. Liquid limit, Plastic limit and Shrinkage limit, plasticity index.

2.8 Determination of liquid limit, plastic limit and shrinkage limit as per IS code.

2.9 Particle size distribution, mechanical sieve analysis as per IS code particle size distribution Curve, effective Diameter of soil, Uniformity coefficient and coefficient of curvature, well Graded and uniformly graded soils.

2.10 Particle size classification of soils & IS classification of soil]

Unit-3: - Permeability of Soil & Seepage Analysis

3.1 Definition of permeability

3.2 Darcy's law of permeability, coefficient of permeability, typical Values of coefficient of Permeability for Different soil

3.3 Factors affecting permeability

3.4 Determination of coefficient of permeability by constant head and falling head permeability Tests, simple problems to determine coefficient of permeability.

3.5 Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow Lines and Equipotential lines.

3.6 Flow net, characteristics of flow net, application of flow net (no Numerical problems)

Unit-4: - Shear Strength of Soil

4.1 Shear failure of soil, field situation of shear failure

4.2 Concept of shear strength of soil

4.3 Components of shearing resistance of soil – cohesion, internal friction

4.4 Mohr-coulomb failure theory, Strength envelope, strength equation

4.5 Purely cohesive and cohesion less soils

4.6 Laboratory determination of shear strength of soil – Direct shear test, unconfined Compression test & vane shear test, Plotting strength envelope, Determining shear strength Parameters of soil

Unit-5: - Bearing Capacity of Soils

5.1 Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable Bearing Pressure

5.2 Terzaghi's analysis and assumptions made.

5.3 Effect of water table on bearing capacity

5.4 Field methods for determination of bearing capacity – Plate load test and standard penetration Test. Test Procedures as Per IS: 1888 & IS: 2131.

5.5 Typical values of bearing capacity from building code IS: 1904

5.6 Definition of active earth pressure and passive earth pressure, Structures subjected to earth Pressure in the Field

Unit-6: - Compaction of Soil & Stabilization

6.1 Concept of compaction, purpose of compaction field situations where compaction is required.

6.2 Standard proctor test – test procedure as per IS code, Compaction Curve, optimum moisture Content, Maximum dry density, Zero air Voids line.

6.3 Modified proctor test

6.4 Factors affecting compaction

6.5 Field methods of compaction – rolling, ramming & vibration and Suitability of various Compaction equipment.

6.6 California bearing ratio, CBR test, significance of CBR value

6.7 Difference between compaction and consolidation

6.8 Concept of soil stabilization, necessity of soil stabilization

6.9 Different methods of soil stabilization – Mechanical soil Stabilization, lime stabilization, cement Stabilization, bitumen stabilization, fly-ash stabilization

Unit-7: - Site Investigation and Sub Soil Exploration

7.1 Necessity of site investigation & sub-soil exploration.

7.2 Types of exploration – general, detailed.

7.3 Method of site exploration open excavation & boring

7.4 Criteria for deciding the location and number of test pits and bores

7.5 Disturbed & undisturbed soil samples for lab testing.
7.6 Field identification of soil – dry strength test, dilitancy test & toughness test
7.7 Empirical correlation between soil properties and SPT values

Course Outcome
- Ability to classify soils based on their physical and mechanical properties.
- Proficiency in determining soil permeability, compaction, and strength through laboratory and field testing.
- Competence in analyzing soil behavior under different loading and environmental conditions.
- Skill in designing safe and efficient foundations and earthworks based on soil characteristics.
- Practical understanding of soil mechanics principles for geotechnical problem-solving.

TRANSPORTATION ENGINEERING

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	**T**	**P**	
PCE2204	4	0	0	4
	-	-	-	

CONTENTS: THEORY

Course Objectives:
- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.
- To perform different tests on road materials.
- To identify the components of railway tracks

Unit-1: - Overview of Transportation Engineering
1.1 Role of transportation in the development of nation.
1.2 Modes of transportation system – roads, railway, airways, waterways, Importance of each Mode, comparison and their relative merits and demerits.
1.3 Necessity & importance of Cross drainage works for roads & railways

Unit-2: - Railway Engineering.
2.1 Alignment and Gauges Classification of Indian Railways, zones of Indian Railway. Alignment-Factors governing rail alignment. Rail Gauges – types, factors affecting selection of gauge. Rail track cross sections – standard cross section of BG & M.G Single & double line in cutting and embankment.
2.2 Permanent ways Ideal requirement, component parts. Rails – function & its types. Rail Joints Requirements, Types, Creep of rail, causes & prevention of creep. Sleepers – functions & Requirement, types – wooden, Metal, Concrete sleepers & their suitability, sleeper density. Ballast – function & different types with their Properties, relative merits & demerits. Rail Fixtures & fastenings – fish plate, bearing plates, spikes, bolts,Keys, anchors & anti creepers.
2.3 Railway Track Geometrics. Coning of wheels, tilting of rails, Gradient & its types, Super Elevation Limits of Super elevation on curves, cant deficiency negative cant, grade Compensation on curves.
2.4 Branching of Tracks Definition of point & crossing, a simple split switch turnout consisting of Points and Crossing lines. Sketch showing different components, their functions & working. Line sketches of track Junctions-crossovers, scissor cross over, diamond crossing, triangle. Inspection of points and crossings
2.5 Station and Yards: Site selection for railway stations, Requirements of railway station, Types of Stations (Way side, crossing, junction & terminal) Station yards, types of station yard, Passenger yards, Goods yard Locomotive yard – its requirements, water column, Marshalling Yard – its types.
2.6 Track Maintenance- Necessity, types, Tools required and their function, organization, duties of Permanent Way inspector, gang mate and key man.

Unit-3: - Bridge Engineering:
3.1 Site selection and investigation Factors affecting selection of site of a bridge. Bridge alignment Collection of Design data Classification of bridges according to function, material, span, Size,

Alignment, position of HFL.

3.2 Component parts of bridge. Plan & sectional elevation of bridge showing component parts of, Substructure & Super structure. Different terminology such as effective span, clear span, Economical span, waterway, afflux, Scour, HFL, freeboard, etc. Foundation – function, types Piers-function, requirements, types. Abutment –Function, types Wing walls – functions and types. Bearing – functions, types of bearing for RCC & steel Bridges. Approaches –in cutting and embankment. Bridge flooring- open and solid floors

3.3 Permanent and Temporary Bridges-Permanent Bridges - Sketches & description in brief of Culverts, causeways, Masonry, arch, steel, movable steel bridges, RCC Girder Bridge, prestressed, Girder Bridge, cantilever, suspension Bridge. Temporary Bridges- timber, flying, floating bridges

3.4 Inspection & Maintenance of Bridge. Inspection of bridges Maintenance of bridges & types – routine & Special maintenance

Unit-4: - Tunnel Engineering.

4.1 Definition, necessity, advantages, disadvantages

4.2 Classification of tunnels.

4.3 Shape and Size of tunnels

4.4 Tunnel Cross sections for highway and railways

4.5 Tunnel investigations and surveying –Tunnel surveying locating center line on ground, Transferring center Line inside the tunnel.

4.6 Shaft - its purpose & construction.

4.7 Methods of tunneling in Soft rock-needle beam method, fore-poling method. Line plate Method, shield Method.

4.8 Methods of tunneling in Hard rock-Full-face heading method, Heading and bench method, drift Method.

4.9 Precautions in construction of tunnels

4.10 Drilling equipment-drills and drills carrying equipment

4.11 Types of explosives used in tunneling. Tunnel lining and ventilation

Course Outcomes:

- Ability to analyze and evaluate transportation networks for efficiency and effectiveness.
- Proficiency in applying engineering principles to solve transportation-related problems.
- Competence in designing sustainable and safe transportation systems.
- Understanding of the interrelationships between transportation and urban planning.
- Capability to utilize modern tools and techniques for transportation analysis and management.

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Railway Engineering	S.C. Saxena	Dhanpatrai & sons
Railway Track	K.R. Antia	The New Book Co. Pvt. Ltd Mumbai
Principles of Railway Engineering	S.C. Rangwala	Charotar Publication
Road, Railway and Bridges	Birdi & Ahuja.	Std. Book House
Tunnel Engineering	S.C. Saxena	Dhanpatrai & sons
Transportation Engineering	Bipin Sinha	Foundation Publishing

HYDRAULICS

Subject Code	Theory			Credits
	No. Of Period Per Week			
PCE2205	L	T	P	5
	3	0	4	
	-	-	-	

CONTENTS: THEORY

Course Objective

- Introduce fundamental principles of fluid mechanics, including properties of fluids, hydrostatics, and fluid dynamics.
- Develop understanding of flow measurement techniques and hydraulic systems design.
- Analyze real-world hydraulic structures and systems, such as pumps, turbines, and pipelines.
- Enhance problem-solving skills related to open channel and pipe flow.
- Provide hands-on experience through experiments and applications of hydraulic principles in engineering projects.

Unit-1: - Properties of Fluid

1.1 Definition of fluid, Difference in behavior of fluid with respect to solids. Introduction to fluid Mechanics and hydraulics, Branches of hydraulics- Hydrostatics and hydrodynamics, Importance of hydraulics with respect to Irrigation and Environmental engineering.

1.2 Physical properties of fluid Mass density, Weight density, Specific volume, Specific gravity, Surface tension and capillarity, Compressibility, Viscosity, Newton's law of viscosity – Dynamic And kinematics viscosity

Unit-2: - Hydrostatics Pressure

2.1 Free liquid surface, Definition of pressure and its SI unit Hydrostatic pressure at point, Pascal's law Variation of pressure in horizontal and vertical direction in static liquid Pressure Diagram.

2.2 Total hydrostatic pressure and center of pressure, Determination of total pressure & center of Pressure on vertical & inclined faces of dams, sluice gates, sides and bottom of water tanks, Determination of total hydrostatics pressure & center of pressure on sides and bottom of Tank containing two liquids. Determination of net hydrostatic pressure and center of Pressure on Vertical surface in contact with liquid on either side. Numerical Problems

Unit-3: - Measurement of Liquid Pressure in Pipes

Concept of pressure head and its unit, Conversion of pressure head of one liquid in to other Devices for pressure measurements in pipes – Piezometer, U-tube manometer, Bourdon's Pressure gauge. Principle of working and limitations. Measurement of pressure difference Using differential manometer U-tube differential manometer and inverted U-tube differential Manometer. Numerical Problems.

Unit-4: - Fundamentals of Fluid Flow

4.1 Concept of flow, Gravity flow and pressure flow. Types of flow – steady and unsteady, Uniform and non-uniform, Laminar and Turbulent. Various combinations of flow with practical Examples, Reynolds number and its application, Stream line and equipotential line. Flow net

And its uses

4.2 Discharge and its units Continuity equation for fluid flow. Datum head, pressure head, velocity Head and total head, Bernoulli's theorem, Loss of head and modified Bernoulli's theorem, Impulse momentum theorem Numerical Problems]

Unit-5: - Flow of Liquid through Pipes
5.1 Loss of head due to friction, Darcy-Weisbach Equation Friction factor, relative roughness. Moody's diagram and its use. Common range of friction factor for different types of pipe Material.
5.2 Minor loss of head in pipe flow- loss of head due to sudden Contraction, sudden expansion, Gradual contraction & expansion, at entrance and exit of pipe in various pipe fittings. Pipes in Series and parallel Equivalent pipe – Dupuit's equation
5.3 Hydraulic gradient line and Energy gradient line, Siphon pipe. Water hammer in pipes – cause Effects and remedial measures Use of Nomograms for design of water distribution system. Numerical

Unit-6: - Flow Through Open Channel
6.1 Types of channels- artificial & natural, purposes of artificial channel, Different shapes of Artificial channels Geometrical properties of channel section–wetted area, wetted Perimeter, Hydraulics radius Prismatic channel sections, steady uniform flow through prismatic channel Section.
6.2 Chezy's equation and Manning's equation for calculation of discharge through an open Channel, common range of values of Chezy's constants and Manning's constant of different Types of channel surfaces. Most economical channel section, conditions for most economical Channel sections.
6.3 Fraud's number and its significance. Critical, sub-critical and supercritical flow in channel Hydraulic jump its occurrence in field, uses of hydraulic jump.

Unit-7: - Flow Measuring Devices
7.1 Velocity measuring devices for open channels. Floats-surface, subsurface and float rod, Pitot Tube – principle, expression for velocity Current meter-cup type & propeller type
7.2 Discharge measuring devices for channels, Notches -Types of notches, expression for discharge. Francis formula, end contraction and velocity of approach Weirs - Broad crested weir, ogee Spillway, and expression for discharge. Flumes - Venturi flume, standing wave flume, Expression for discharge. Velocity area method for measurement of discharge through open Channels. Discharge measuring devices for pipes.
7.3 Venturimeter – Component parts, principle of working, Study and use of Water meter Flow Through orifice Orifice- Definition and use, Types of orifice based on various criteria. Coefficient Of contraction, coefficient of velocity and coefficient of discharge, Relationship between them. Discharge through small sharp-edged circular orifice Determination of hydraulic coefficient of Orifice. Numerical

Unit-8: - Hydraulic Machines
Pumps - Definition and types. Suction head, delivery head, static head and monomeric head. Centrifugal pump - component parts and their functions, principle of working, priming. Reciprocating pump - component parts and working. Submersible pump and Jet pump. Selection and choice of pump. Computation of power required for pumps.

Turbines - Definition and types

Course Outcome

- Demonstrate knowledge of fluid properties and behavior in static and dynamic conditions.
- Apply principles of fluid mechanics to design and analyze hydraulic systems and components.
- Use analytical and computational tools to solve practical hydraulic engineering problems.
- Conduct experiments to measure flow parameters and interpret results effectively.
- Develop sustainable solutions for hydraulic challenges in environmental and civil engineering contexts.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Hydraulics & Fluids Mechanics	Dr. P.N. Modi & Dr. S.M. Seth	Standard Book House, Dehli
Hydraulics & Fluids Mechanics	S. Ramamrutham	Dhanpat Rai & Sons, Delhi
A Text Book of Hydraulics, Fluids Mechanics Hydraulics Machines	R.S. Khurmi	S. Chand & Company Ltd. New Delhi
A Text Book of Fluids Mechanics Hydraulics Machines	R.K. Rajput	S. Chand & Company Ltd. New Delhi
Flow Through open Channels	K.G. Ranga Raju	Taio McGraw. Hill Publishing Company Ltd. New Delhi
Hydraulic	B.K. Singh	Foundation Publishing

ADVANCE SURVEYING LAB

Subject Code PCE2201P	Theory			Credits
	No. Of Period Per Week			
	L	T	P	2
	0	0	4	
	-	-	-	

CONTENTS: PRACTICAL

INTELLECTUAL SKILL:
1) Identify the components of plane table, theodolite, and advanced survey instruments.
2) Know the working principles of these survey instruments.
3) Finding the horizontal and vertical distances.
4) Identifying errors in setting out curve and tabulating elements of a curve.

Motor Skills:
1) Taking and recording the observation in the field book.
2) Preparing drawings, maps etc. with the observed data.
3) Setting out curve for the given alignment.
4) Use Micro optic theodolite, EDM for finding different parameters.

Instructions:-
1) Group size for Practical work should be limited to maximum 6 Students.
2) Each student from the group should handle the instrument to understand. The function
   Of different components and use of the instrument.
3) Drawing, plotting should be considered as part of practical.
4) One full day per project is required for carrying out project work, which is to be plotted
   On a drawing sheet.
5) TERM WORK SHOULD CONSIST OF RECORD OF ALL PRACTICALS AND PROJECTS, IN FIELD BOOK
   AND DRAWING SHEETS FOR THE GIVEN PROJECTS.

LIST OF PRACTICAL :(MINIMUM 12 PRACTICAL FROM LIST GIVEN BELOW)
1) USING ACCESSORIES CARRY OUT TEMPORARY ADJUSTMENTS OF PLANE TABLE.
   LOCATING DETAILS BY METHOD OF RADIATION.
2) Locating details with plane table by method of intersection.
3) Understanding the components of Theodolite and their functions, reading the Vernier
   And temporary adjustments of theodolite.
4) Measurement of Horizontal angle by transit theodolite.
5) Measurement of Horizontal angle by method of Repetition.
6) Measurement of vertical angles by theodolite.
7) Measurement of Magnetic bearing of a line using theodolite.
8) Measurement of deflection angle by taking open traverse of 4 –5 sides.
9) To find reduced levels and horizontal distances using theodolite as a Tacheometer.
10) To find constants of a given Tacheometer.
11) Study and use of 1 second Micro Optic Theodolite for measurement of
Horizontal and Vertical angles
12) Study of E.D.M. for knowing its components.
13) Use of EDM for finding horizontal and vertical distances and reduced levels.
14) Determine the geographical parameters by total station

List of Projects:

1) Plane table survey project for 5-6 sided traverse and locating details of buildings, Roads etc. by radiation and Intersection method, Sheet to be drawn by each Student separately on A-1 size imperial drawing sheet.

2) Theodolite traverse Survey for a closed traverse of 5-6 sides for a small Area. Computation by Gale's traverse table. Plotting the traverse with Details on A1 size imperial drawing sheet.

3) Setting out simple circular curve by Rankine's method of Deflection angles for a Given problem and plotting the details of curve on A-1 size imperial drawing Sheet

MECHANICS OF STRUCTURE LAB

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	1
PCE2202P	0	0	2	
	-	-	-	

CONTENTS: PRACTICAL

Intellectual Skills:

1. Interpret the results. Calculate design parameters.

Motor Skills:

1. Observe the phenomenon during testing of specimen.

2. Draw the graphs and diagrams.

List of Practical:

Group – A (Any Six)

1. Identify the components of universal testing machine & tension test on mild steel.

2. Tension test on tor steel / deformed bars.

3. Izod Impact test on mild steel, brass, copper and cast iron.

4. Charpy impact test on mild steel, brass, copper and cast iron.

5. Flexural test on timber.

6. Flexure test on floor tiles or roofing tiles.

7. Shear Test on metal.

8. Water Absorption & Compression test (Dry & Wet) on bricks

9. Abrasion Test on flooring tiles.

Group - B

1. Drawing of Shear force and Bending Moment diagrams on
Graph Paper (6 Problems)

2. Graphical Solution of Two Problems on simple frames I) Cantilever

SOIL MECHANICS LAB

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	
PCE2203P	0	0	2	1
	-	-	-	

CONTENTS: PRACTICAL

Intellectual Skills:

a. Identify properties of soil.

b. Interpret test results.

C. Follow IS procedure of testing.

Motor Skills:

a. Measure the quantities accurately.

b. Handle the instruments carefully.

List of Practical (Any ten):-

1. Determination of water content of given soil sample by oven drying method As per IS Code.

2. Determination of bulk unit weight dry unit weight of soil in field by core cutter **Method as per IS Code.**

3 Determination of bulk unit weight dry unit weight of soil in field by sand Replacement method as per IS Code.

5. Determination of Liquid limit & Plastic limit of given soil sample as per IS Code.

6 Determination of grain size distribution of given soil sample by mechanical Sieve analysis as per IS Code.

7. Determination of coefficient of permeability by constant head test

8. Determination of coefficient of permeability by falling head test

Practical (Live demo or Prerecorded demo)

9. Determination of shear strength of soil using direct shear test.

10. Determination of shear strength of soil using Laboratory Vane shear test

11. Determination of MDD & OMC by standard proctor test on given soil sample As per IS Code.

12. Determination of CBR value of given soil sample.

13. Determination of shear strength of soil using unconfined compressive Strength.

14. Determination of shear strength of soil using tri-axial shear test

HYDAULICS LAB

Subject Code PCE2205P	Theory			Credits
	No. Of Period Per Week			
	L	T	P	2
	0	0	4	
	-	-	-	

CONTENTS: PRACTICAL

Intellectual Skills:

a. Interpret test results

b. Calculate quantities of parameters

c. Draw graphs

Motor Skills:

a. Measure different parameters accurately

b. Adjust levels by operating valves

List of Practical:

1. Measurements of pressure and pressure head by Piezometer, U-tube manometer
2. Measurement of pressure difference by U-tube differential manometer. Study of bourdon's Gauge
3. Verification of Bernoulli's theorem
4. Reynolds experiment to study types of flow.
5. Determination of Darcy's friction factor for a given pipe
6. Determination of Minor losses in pipes (any two)
7. Study and use of Moody's diagram, Nomogram of Manning's equation
8. Determination of Manning's constant or Chezy's constant for given rectangular channel section.
9. Demonstration of Hydraulic jump
10. Determination of coefficient of discharge for given rectangular or triangular notch.
11. Determination of coefficient of discharge for a given Venturimeter.
12. Demonstration and use of Pitot tube and current meter
13. Determination of hydraulic coefficients for sharp edge orifice.
14. Study & use of water meter.
15. Study of a model of centrifugal and reciprocating pump.
16. Use of characteristic curves/ nomograms /charts / catalogs from manufactures for selection of Pump for the designed discharge and head (Refer IS: 9694)

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

SEMESTER V
THEORY

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PCE3101	Theory of Structure	4	0	0	4
2	PCE3102	Design of Steel Structure	3	1	0	4
3	PCE3103	Estimating and Costing	3	1	0	4
4	PCE3104	Highway Engineering	4	0	0	4
5	PCE3105	Irrigation Engineering	4	0	0	4

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PCE3101P	Theory of Structure Lab	0	0	2	1
2	PCE3102P	Design of Steel Structure Lab	0	0	2	1
3	PCE3104P	Highway Engineering Lab	0	0	2	1
4	PCE3105P	Irrigation Engineering Lab	0	0	2	1
				Total		24

THEORY OF STRUCTURES

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	4
PEE2201	4	0	0	
	-	-	-	

Course Objective:

- To introduce the fundamental concepts and principles of structural analysis and design.
- To develop the ability to analyze and understand the behavior of various types of structural Systems under different loads.
- To provide a foundation for the application of static and dynamic equilibrium in the analysis of Structures.
- To familiarize students with key analytical methods like force methods, displacement methods, And matrix analysis.
- To prepare students for more advanced topics in structural engineering, focusing on stability, Strength, and design considerations.

CONTENTS: THEORY

Unit 01: Direct And Bending Stresses

1.1   Concept Of Direct And Eccentric Loads
  - ➢ Eccentricity About One Principal Axis
  - ➢ Nature Of Stresses
  - ➢ Maximum And Minimum Stresses
  - ➢ Resultant Stress Distribution Diagram.

1.2   Condition For No Tension Or Zero Stress At Extreme Fiber
  - ➢ Limit Of Eccentricity
  - ➢ Core Of Section For Rectangular And Circular Cross Sections.

1.2   Columns, Pillars And Chimneys Of Uniform Section Subject To Lateral Wind Pressure
  - ➢ Coefficient Of Wind Resistance
  - ➢ Stress Distribution At Bases

Unit 02: Slope And Deflection

2.1   Concept Of Slope And Deflection, Stiffness Of Beam
2.2   Relation Between Slope, Deflection And Radius Of Curvature
  - ➢ Differential Equation (No Derivation)
  - ➢ Double Integration Method To Find Slope And Deflection Of Simply Supported And Cantilever Beam
2.3   Macaulay's Method For Slope And Deflection
  - ➢ Application To Simply Supported And Cantilever Beam Subjected To Concentrated And Uniformly Distributed Load.

Unit 03: Fixed Beam

3.1   Concept Of Fixity, Effect Of Fixity, Advantages And Disadvantages Of Fixed Beam.

3.2   Principle Of Superposition.

3.3   Fixed End Moments From First Principle For Beam Subjected To Udl Over Entire Span
- Central Point Load
- Point Load Other Than Mid Span.

3.4   Application Of Standard Formulae In Finding Moments And Drawing S.F. And B.M. Diagrams For A Fixed Beam (Derivation Need Not Be Asked In The Examination)

Unit 04: Continuous Beam

4.1   Definition, Effect Of Continuity Practical Example
- Nature Of Moments Induced Due To Continuity
- Concept Of Deflected Shape

4.2   Clapeyron's Theorem Of Three Moment (No Derivation)

4.3   Application Of Theorem Maximum Up To Three Spans And Two Unknown Support Moment Only,   Support At Same Level, Spans Having Same Moment Of Inertia Subjected To Concentrated Loads And Uniformly Distributed Loads Over Entire Span.

4.4   Drawing Sf And Bm Diagrams For Continuous Beams.

Unit 05: Moment Distribution Method

5.1   Introduction, Sign Convention

5.2   Carry Over Factor
- Stiffness Factor
- Distribution Factor.

5.3   Application Of Moment Distribution Method For Various Types Of Continuous Beams Subjected To

Concentrated Loads And Uniformly Distributed Load Over Entire Span Having Same Or Different Moment Of Inertia Up To Three Spans And Two Unknown Support Moment Only, Sf And Bm Diagrams (Supports At Same Level)

5.4   Application Of Moment Distribution Method To Single Storey Single Bay Symmetrical Portal Frames, Sf And Bm Diagrams

Unit 06: Columns

6.1   Definition
- Classification Of Column

6.2   Buckling Of Axially Loaded Compression Member
- Types Of End Conditions For Column
- Effective Length
- Radius Of Gyration
- Slenderness Ratio

6.3   Assumptions In The Theory Of Long Column Euler's Theory
- Buckling Load And Rankin's Theory
- Crippling Load
- Factor Of Safety
- Safe Load

6.4   Application Of Rankin's And Euler Theory

➢ Designing Solid Circular Or Hollow Circular Sections

Course Outcome :

By The End Of The Course, Students Should Be Able To:

- Students Will Be Able To Analyze Complex Structural Systems Using Various Classical Methods Of Analysis (Such As Equilibrium, Virtual Work, And Energy Methods).
- Students Will Be Proficient In Solving Problems Related To Beams, Frames, Trusses, And Continuous Structures Under Different Loading Conditions.
- Students Will Demonstrate The Ability To Perform Both Statically Determinate And Indeterminate Structural Analysis.
- Students Will Apply Appropriate Methods For Analyzing Deflections, Internal Forces, And Moments In Structures.
- Students Will Gain A Deep Understanding Of Structural Stability And The Ability To Predict The Behavior Of Structures Under Normal And Extreme Loading Scenarios.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Mechanics of structures	S. B. Junnarkar	Charotar Publishing House, Anand
Theory of structures	S. Ramanrutham	Dhanpatrai & Sons, Delhi
Analysis of Structures	V.N.Vazirani & M.M. Ratwani	Khanna Publishers Delhi

DESIGN OF STEEL STRUCTURES

Subject Code	Theory			Credits
	No. Of Period Per Week			
PEE2202	L	T	P	4
	3	1	0	
	-	-	-	

Course Objective:

- To provide students with the knowledge and skills required for designing structural components using steel as the primary material.
- To introduce the principles of strength, stability, and serviceability in the context of steel structures.
- To familiarize students with the design codes and standards for steel construction (such as IS 800, AISC, or Eurocodes).
- To develop an understanding of the behavior of steel structures under various loads and environmental conditions.
- To equip students with the ability to design steel elements like beams, columns, connections, and frames while ensuring safety, efficiency, and sustainability.

CONTENTS: THEORY

Unit 01: Introduction
- ➢ Types of sections used
- ➢ Grades of steel and strength characteristics
- ➢ Advantages and disadvantages of steel as construction material
- ➢ Use of steel table and relevant I. S. code
- ➢ Types of loads on steel structure and its I. S. code specification

Unit 02: Connections
- ➢ Riveted connections:-
  - Types of rivets and their use
  - Types of riveted joint and its failure
  - Strength of riveted joint and efficiency of a riveted joint
  - Assumptions in theory of riveted joint Design of riveted joint for axially loaded member.
- ➢ Welded connection:-
  - Introduction
  - Permissible stress in weld
  - Strength of weld
  - Advantages and disadvantages of welded joint
  - Types of weld and their symbols
  - Design of fillet weld and butt weld subjected to axial load.

Unit 03: Design of Tension Member

- ➢ Types of sections used
- ➢ Permissible stresses in axial tension and gross and net cross- sectional area of tension member analysis and design of tension member with welded and riveted connection
- ➢ Introduction to Lug Angle and Tension splice.

Unit 04: Design of Compression Member
- ➢ Angle struts
- ➢ Types of Sections used
- ➢ Effective length
- ➢ Radius of gyration
- ➢ Slenderness ration and its limit
- ➢ Permissible compressive stresses
- ➢ Analysis and Design of axially loaded angle struts with welded and riveted connection.
- ➢ Stanchion and Columns types of sections used
- ➢ Simple and built up sections, effective length
- ➢ Analysis and design of axially loaded column introduction to lacing and battening (No numerical problem on Lacing and Battening)

Unit 05: Steel Roof Truss
- ➢ Types of steel roof truss & its selection criteria
- ➢ Calculation of panel point load for Dead load
- ➢ Live load and wind load as per I.S. 875-1987 Analysis and Design of steel roof truss
- ➢ Design of Angle purlin as per I.S. Arrangement of members at supports.

Unit 06: Beams
- ➢ Different steel sections used; Simple and built-up sections Permissible bending stresses
- ➢ Design of simple beams, check for shear only. Design of built-up beams (Symmetrical I Section with cover plates only), check for shear only
- ➢ Introduction to Plate Girder: Various components and their functions. (No numerical Problem on Plate Girder

Unit 07: Column Bases
- ➢ Types of column bases design of slab base & concrete block introduction to gusseted base (no numerical problems on gusseted Base)

Course Outcome :
By the end of the course, students should be able to:
- • Students will be able to design steel structural elements such as beams, columns, and connections according to relevant design codes and standards.
- • Students will be able to analyze and design for various loading conditions, including dead loads, live loads, wind, and seismic forces.
- • Students will demonstrate an understanding of the behavior of steel under different types of stresses, such as bending, shear, and axial load.

- Students will be able to design and optimize connections in steel structures, including welded,

bolted, and riveted connections, ensuring structural integrity and safety.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Electrical Technology	E. Hughes	Logmans, London
Electrical Technology	H. Cotton	C. B. S. Publisher New Delhi
Electrical Technology Vol. II	B. L. Theraja	S. Chand & C0 Delhi
Electrical Machine Design Dhanpatrai & Sons, New Delhi	A. K. Sohawney	Dhanpatrai & Sons, New Delhi
Electrical Technology	E. Hughes	Logmans, London

ESTIMATING & COSTING

	Theory			Credits
Subject Code	**No. Of Period Per Week**			
PEE2203	**L**	**T**	**P**	**4**
	3	**1**	**0**	
	-	-	-	

Course Objective:
- To provide students with an understanding of the principles and techniques involved in construction estimation and costing.
- To develop the ability to prepare detailed estimates for construction projects, including material, labor, and overhead costs.
- To introduce students to different methods of costing, such as detailed estimates, approximate estimates, and quantity surveying.
- To familiarize students with the preparation of bills of quantities (BOQ) and understanding of tendering processes.
- To equip students with the knowledge to analyze cost control techniques and manage project costs effectively throughout the construction lifecycle.

CONTENTS: THEORY

Unit 01: Overview Of Estimating & Costing
1.1   Meaning of the terms estimating, costing
   ➢   Purpose of estimating and costing.
1.2   Types of estimate - Approximate and Detailed
   ➢   Approximate estimate Types:
      - Plinth area rate method
      - Cubi Content method
      - Service Unit method
      - Typical bay method
      - Approximate Quantity method
      - Problems on Plinth area rate method & application of Service unit method for selection of service unit for different types of civil Engineering Structures.
1.3   Types of detailed estimate
   ➢   Detailed estimate for new work
   ➢   Revised estimate
   ➢   Supplementary estimate
   ➢   Revised Supplementary estimate
   ➢   Maintenance & Repair estimate
   ➢   Uses of detailed estimate.

Unit 02: Detailed Estimate
2.1   Unit quantity method

➢ Total quantity method

- Data required for detailed estimate
- Factors to be considered during preparation of detailed estimate
- Specification, Quantity availability of material
- Location of site
- Labour Component.

2.2   Steps in preparing detailed estimate
- Taking out quantities, squaring, abstracting.

2.4   Preparing check list – by adoption of Sequence of execution
- Drafting Brief Specification of items
- Contents of measurement Sheet
- Abstract sheet
- Face sheet

Unit 03: Mode of Measurements

3.1   General Rules for fixing units of Measurements for different – items of work as per IS 1200 & As per PWD Hand Book

3.2   Desired accuracy in taking measurements of various items of work & rules for deductions as per IS 1200 & P.W.D. handbook.

Unit 04: Procedure for Preparing Detailed Estimate

4.1   Procedure for taking out quantities for various items of works by P.W.D & IS 1200 for:-
- Load bearing Structure –Long Wall and short wall method , Center line method .
- Framed Structure building. --- By using thumb rules for reinforcement quantity calculation by preparing bar bending Schedule

4.2   Provisions in detailed estimate for contingencies
- Work charged establishment
- Provisional items
- Provisional Sum
- Provision for water Supply & Sanitary works
- Electrical wiring & installations
- Centage charges
- Tools & Plants
- Prime cost
- Day work.

Unit 05: Rate analysis

5.1   Meaning of term Rate analysis –Factors affecting rate analysis
- Lead
- Lift
- Task work,
- Materials and labour component
- Market Rate and labour rate.

5.2   Transportation of Materials

- Load factor for different materials, Standard lead , extra lead, Transportation Charges

- Labour - Categories of labours, labour rates, overheads, contractor's profit, water charges, taking out quantities of materials for different items of works.

5.3   Preparing rate analysis of different items of work

5.4 Standard Schedule of rates, full rates & labour rates.
- Taking out quantities of work for different Civil Engineering Works Roads, Dam , Canals ,Railway embankments
- Methods of mean area , mid sectional area, trapezoidal, Prismoidal formula
- Calculation of quantity of earth work

Course Outcome :

By the end of the course, students should be able to:
- Students will be able to prepare accurate and comprehensive cost estimates for various types of construction projects.
- Students will demonstrate the ability to apply different estimating techniques, such as unit rate methods and detailed quantity surveying.
- Students will be proficient in preparing bills of quantities (BOQ) and understanding the tendering and bidding processes.
- Students will gain the ability to analyze and control construction project costs, ensuring efficiency and cost-effectiveness.
- Students will be capable of using cost management tools to monitor and adjust project costs in alignment with budgets and time constraints.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Estimating & costing in Civil Engineering	D. Roy Choudhury	UBS Publishers Distributors Pvt Ltd New Delhi
Estimating & costing, Specification and Valuation in Civil Engineering	Estimating & costing, Specification and Valuation in Civil Engineering M. Chakraborti	M. Chakraborti , Calcutta
Estimating & costing	S.C. Rangwala	Charotar Publication, Anand
Civil Engineering Estimating, Contracts and accounts Vol . I	B.S. Patil	Orient Longman, Mumbai
Estimating & costing	G. S. Birdie	Dhanpat Rai and Sons Delhi

HIGHWAY ENGINEERING

Subject Code	Theory			Credits
	No. Of Period Per Week			
PEE2204	L	T	P	4
	4	0	0	
	-	-	-	

Course Objective:
- To provide students with a comprehensive understanding of the principles, design, and construction of highways and transportation infrastructure.
- To develop the skills necessary for planning, designing, and maintaining safe and efficient roadways.
- To familiarize students with traffic analysis, geometric design, pavement materials, and drainage systems.
- To introduce students to modern technologies and techniques used in highway construction and maintenance.
- To provide knowledge on environmental, economic, and social impacts related to highway projects.

CONTENTS: THEORY

Unit 01: Road Engineering :
1.1   Importance of road in India.
1.2   Classification of roads according to Nagpur plan (Location and function), and third road development plan. Traffic and tonnage.
  1.3   Classification of urban roads

Unit 02: Investigation for Road Project
2.1   Reconnaissance survey
  ➢ Preliminary survey and Location survey for a road project.
2.2   Detailed survey for cross drainage- L-section and C/S sections.
2.3   Fixing the alignment of road
  ➢ Factors affecting alignment of road.
 2.4   Drawings required for road project-
  ➢ Key map
  ➢ Index map
  ➢ Preliminary survey plan and detailed location survey plan
  ➢ L-section and C/S sections cross drainage work
  ➢ Land acquisition plan.
  2.5   Survey for availability of construction material, location plan of quarries.

Unit 03: Geometric Design Of Highways
3.1   Camber- definition, purpose, types, IRC – specifications.

3.2   Kerbs, road margin, road formation, right of way.

3.3   Design speed- IRC – specifications

3.4   Gradient – definition, types, IRC specification.

3.5   Sight distances– definition, types, IRC specification.

3.6   Curves–Necessity, types– horizontal, vertical and transition curves.

3.7   Widening of roads on curves.

3.8   Super Elevation – definition, formula for calculating superelevation, minimum and maximum values of super elevation, and methods of providing super elevation.

3.9   Sketching of standard C/S of national highway in embankment and cutting.

3.10   Simple problems on geometric design of road. switchgear ELCB and MCB and wiring accessories.

3.8   Earthing of Residential Installation.

3.9   Sequence to be followed for preparing Estimate

3.10   Preparation of detailed estimates and costing of Residential Installation.

Unit 04: Construction of Roads Pavements and materials

4.1 Types of road materials and Tests – soil, aggregates, bitumen, Cement Concrete
- Test on soil sub grade- C.B.R. test
- Test on Aggregate – Los Angeles abrasion, impact, and shape test
- Tests on bitumen- Penetration, Ductility and Softening point test.

4.2 Pavement
- Objective of pavement
- Structure of pavement
- Function of pavement components
- Types of pavement.

4.3 Construction of earthen road –
- General terms used- borrows pits, spoil bank, lead and lift, balancing of earthwork
- Construction procedure.

4.4 Soil stabilized roads –
- Necessity
- Methods of soil stabilization
- Brief details of mechanical soil stabilization.

4.5 Water bound macadam roads –
- Materials used
- Size and grading of aggregates and screening
- Construction procedure including precautions in rolling.

4.6   Construction of bituminous roads.
- Terms used–bitumen, asphalt, emulsion, cutback, tar, common grades adopted for construction.
- Types of bituminous surface – prime coat,   tack coat, seal coat
- Surface dressing – procedure of construction bituminous penetration macadam, and Bitumen/Tar carpets – procedure of construction.

4.7 Cement concrete pavements
- Construction procedure and equipments
- Construction joints
- Joint filler

➢ Joint sealer.

Unit 05: Traffic Engineering

5.1   Traffic volume study,

5.2   Traffic control devices-road signs, marking, Signals, Traffic island.

5.3   Road intersections- intersections at grade and grade separator intersections.

5.4   Road accident. Building code IS:1904

5.5   Definition of active earth pressure and passive earth pressure, structures subjected to earth pressure in the field

Unit 06: Hill Roads

6.1   Parts and functions of hill road components, types of curves, Hill road formation.

6.2   Landslides- causes and prevention.

 6.3   Structures- drainage structures

Unit 07: Drainage of Roads

7.1   Surface drainage – side gutter, catch water drains, surface drainage.

7.2   Sub-surface drainage –Longitudinal drains and cross drains

Unit 08: Maintenance and Repairs of Roads

8.1   Necessity of maintenance of roads

8.2   Classification of maintenance operation – ordinary, routine and periodic maintenance.

8.3   Maintenance of W.B.M., bituminous and cement concrete roads

Course Outcome :

By the end of the course, students should be able to:

- Students will be able to design geometric features of highways, such as alignment, cross-sections, and intersections.
- Students will demonstrate the ability to plan and analyze traffic flow, capacity, and safety of highways.
- Students will be proficient in the selection of materials and design of flexible and rigid pavements.
- Students will be able to design effective drainage systems for highways and understand their importance in road sustainability.
- Students will gain the knowledge to assess and address the environmental, economic, and social impacts of highway projects, ensuring sustainable development.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Highway Engineering	Highway Engineering	Khanna Publication
Traffic Engineering	L.R. Kadiyali	--
Transportation Engineering	N.L. Arora, S.P. Luthara	I.P.H. New Delhi
Transportation Engineering	Vazarani & Chandola	Khanna Publication.
Road, Railway, Bridges	Biridi & Ahuja.	S.B.H.New Delhi
Highway Engineering	B.K. Mathur	Foundation Publishing

IRRIGATION ENGINEERING

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	4
	4	0	0	
	-	-	-	

Course Objective:
- To provide students with an understanding of the principles and methods used in the design, operation, and management of irrigation systems.
- To familiarize students with different types of irrigation techniques, including surface, sprinkler, and drip irrigation.
- To develop skills in water management, ensuring the efficient use of water resources in agricultural applications.
- To introduce students to the study of soil-water-plant relationships and how they influence irrigation practices.
- To equip students with the ability to design irrigation systems that enhance agricultural productivity while minimizing water wastage.

CONTENTS: THEORY

Unit 01: Introduction
- ➢ Definition – Irrigation and irrigation engineering
- ➢ advantages of irrigation
- ➢ Ill effects of over irrigation
- ➢ Types of irrigation project purpose wise and administrative wise
- ➢ Methods of irrigation.

Unit 02: Water Requirement Of Crops
- ➢ Cropping seasons and crop in Maharashtra
- ➢ Definition – Crop period, base period
- ➢ Duty & Delta , factors affecting Duty , relation between Duty, Delta and base period
- ➢ Definition – CCA , GCA, IA, intensity of irrigation time factor capacity Factor
- ➢ Problems on water requirement and capacity of canal
- ➢ Modified Penman method
- ➢ Assessment of irrigation water.

Unit 03: Investigation And Reservoir Planning
- ➢ Survey for irrigation project data collected for irrigation project
- ➢ Area capacity curve
- ➢ silting of reservoir
  - • Rate of silting
  - • Factors affecting silting
- ➢ Methods to control levels and respective storage in reservoir
- ➢ Fixing control levels

Unit 04: Dams And Spillways

➢ Types of dams – Earthen dams and Gravity dams (masonry and concrete)

- Comparison of earthen and gravity dams with respect to foundation
  - seepage
- construction and maintenance Earthen Dams –
  - Components and their function
  - Typical cross section seepage through embankment and foundation seepage control though embankment and foundation
  - Methods of constructions
  - Types of failure of earthen dams and remedial measures.
- Gravity Dams Theoretical and practical profile
  - Typical cross section
  - Drainage gallery
  - Joint in gravity dam
  - High dam and low dam
- Spillways-Definition, function
  - Location and components
- Emergency and services
- ogee spillway and bar type spillway
  - Discharge over spillway
  - Spillway with and without gates

Unit 05: Bandhara Precolation Tanks And Lift Irrigation
- Advantages and disadvantages of bandhara irrigation
- Layout and component parts
- Solid and open bandhara.
- Percolation Tanks –
  - Necessity and importance
  - Selection of site
  - Layout of lift irrigation scheme
  - Irrigation department standard design and specification

Unit 06: Divertion Head Works
- Weirs –
  - Components part
  - Function and types
  - Layout of diversion head works with its components and their function
  - Canal head regulator
  - Silt excluders and slit ejectors.
- Barrages –
  - Components and their function
  - Difference between weir and barrage
  - Irrigation department standard design and specifications

Unit 07: Canals
- Canals –

- Classification of canals according to alignment and position in the canal network
- Design of most economical canal section.

- ➢ Canal lining – Definition, purpose, types of canal lining advantages of canal lining properties of good canal lining material.
- ➢ CD. works- different C.D. works, canal falls, escapes, cross regulators and canal outlet.

Course Outcome:

By the end of the course, students should be able to:

- Students will be able to design and implement efficient irrigation systems, considering crop requirements and soil characteristics.
- Students will demonstrate the ability to select appropriate irrigation methods (surface, sprinkler, drip) based on environmental and agricultural factors.
- Students will gain proficiency in water management techniques to optimize water use in agricultural fields.
- Students will be able to evaluate and manage the performance of irrigation systems, ensuring their sustainability.
- Students will understand the environmental and economic impacts of irrigation practices and apply strategies to conserve water resources effectively.

Text /Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Irrigation and hydraulic structure	S. K. Garg	Khanna publisher, New Delhi
Irrigation Engineering	B.C.punmia	Laxmi Publication, Delhi
Irrigation Engineering	Deepak Verma	Foundation Publishing

THEORY OF STRUCTURE LAB

Subject Code	Theory			Credits
	No.Of Period Per Week			
	L	T	P	
	0	0	2	1
	-	-	-	

Course Objective:
- To provide students with practical experience in analyzing and testing various structural components and systems.
- To develop the ability to verify theoretical concepts of structural analysis through experiments and hands-on activities.
- To familiarize students with laboratory equipment and instruments used in the analysis of forces, moments, and deflections in structures.
- To enhance students' understanding of the behavior of different structural elements under load and their failure mechanisms.
- To build skills in data collection, analysis, and interpretation, ensuring a deeper understanding of theoretical concepts in structural engineering.

CONTENTS: PRACTICAL

➢ To Verify Strain in an externally loaded beam with the help of a strain gauge indicator and to verify Theoretically.
➢ To study behavior of different types of Columns:
- Both ends fixed
- One end fixed and other Pinned
- Both ends pinned
- One end fixed and other free.
➢ To find Euler's buckling load for different types of Columns :
- Both ends fixed
- One end fixed and other pinned
- Both ends pinned
- One end fixed and other free
➢ To Study two hinged arch for the horizontal displacement of the roller end for a given system of loading and to compare the same with those obtained analytically
➢ Determination of Shear force and loading.
➢ Compression test on metal.
➢ Determination of deflection of beam.
➢ Determination of moment of Inertia of fly wheel.

Course Outcome :

By the end of the course, students should be able to:

- Students will be able to conduct experiments to analyze the behavior of structural elements like beams, trusses, and frames under various loading conditions.
- Students will demonstrate the ability to verify theoretical principles of structural analysis, such as bending, shear, and deflection.
- Students will gain proficiency in using laboratory equipment and instruments for testing and measuring forces and displacements in structures.
- Students will develop skills in analyzing experimental data and comparing results with theoretical predictions.
- Students will be able to interpret the results of experiments to assess the strength, stability, and safety of structural elements.

DESIGN OF STEEL STRUCTURE LAB

Subject Code	Theory			Credits
	No.Of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course Objective:
- To provide students with practical experience in testing and designing steel structural components based on real-world applications.
- To familiarize students with various methods for analyzing and testing the strength and stability of steel structures.
- To develop students' skills in designing steel beams, columns, and connections according to design codes and standards.
- To enhance students' understanding of the behavior of steel structures under different loading conditions through hands-on experiments.
- To enable students to evaluate and interpret experimental results to improve their understanding of steel structure design and safety.

CONTENTS: PRACTICAL

PRACTICAL SHALL CONSISTS OF SKETCH BOOK AND DESIGN REPORT OF STEEL ROOF TRUSS FOR AN INDUSTRIAL BUILDING, TWO FULL IMPERIAL SIZE SHEET SHALL BE USED FOR DRAWINGS
Sketch Book:
- ➢ Sketch book shall consists of any five plates out of the below mentioned
  - Typical sketches of sections of tension member, determination of net effective cross sectional area of tension member for angle section.
  - Typical sketches of sections of compression member, determination of effective length for different end conditions.
  - Type of trusses for different spans.
  - Riveted and welded connections for axially loaded member.
  - Column section and slab base
  - Important information of clauses of IS800-1984 and IS875 (Part-1,2 & 3)

Design of Steel roof truss:
- ➢ The student should draw two full imperial size sheets covering design of steel roof truss any one of the truss fink, fan, pratt, lattice truss for Span from 8 to 16 meter the design shall cover calculations for the dead load, live load, wind load with design of the various elements. The drawing shall include detailing the truss for below mentioned elements.
  - Architectural drawing
  - Data for structural design
  - Key plan at tie level
  - Detailed layout of steel roof truss.
  - Details at end support.

Is Codes

- IS 800-1984 Indian Standard code of practice for use of structural steel in general building construction, BIS New Delhi.
- IS-875 Part-1, 2, & 3- 1987 Indian Standard code of practice for use of structural steel in general building construction, BIS New Delhi.
- IS hand book No. 1 Properties of structural steel rolled section
- Steel table.

Course Outcome :

By the end of the course, students should be able to:

- Students will be able to design and analyze steel structural components like beams, columns, and connections using appropriate design codes.
- Students will gain hands-on experience in testing the performance of steel structures and understanding their behavior under different loads.
- Students will demonstrate the ability to apply theoretical knowledge of steel design to practical experiments, ensuring real-world applications.
- Students will develop skills in conducting tests on steel components, measuring deflections, strains, and other parameters, and analyzing the results.
- Students will be able to evaluate the performance and safety of steel structures, offering recommendations for improvements based on experimental findings.

IRRIGATION ENGINEERING LAB

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	1
	0	0	2	
	-	-	-	

Course Objective:
- To provide students with hands-on experience in the design, operation, and analysis of various irrigation systems and equipment.
- To familiarize students with different types of irrigation methods, such as surface, sprinkler, and drip irrigation, through practical experiments.
- To enhance students' understanding of water distribution and measurement techniques in agricultural applications.
- To develop skills in evaluating the performance of irrigation systems and ensuring their efficiency in water use.
- To enable students to analyze soil-water relationships and their impact on irrigation practices in the laboratory setting.

CONTENTS: PRACTICAL

➢ Data should be collected from irrigation engineering department or irrigation project and processed accordingly.
➢ Collection of information and prepare list of documents and drawings required for irrigation project.
➢ Calculation of yield from given Tope sheet of a catchment area, plotting catchment area, determination of catchment area by planimeter.
➢ Canal capacity calculation from a given command area and cropping pattern.
➢ Plotting of area capacity curve of a given contour map of irrigation project
➢ From a given data fixation of control levels of reservoir.
➢ Layout of drainage in earthen dam on A4 size plate
➢ Neat labeled sketch of ogee spillway with gate and energy dissipation arrangement

Course Outcome :

By the end of the course, students should be able to:
- Students will be able to design and test different irrigation systems, including surface, sprinkler, and drip systems, based on practical experiments.
- Students will gain proficiency in measuring and analyzing water distribution efficiency and effectiveness in various irrigation methods.
- Students will demonstrate the ability to evaluate the performance of irrigation systems under different conditions and recommend improvements.
- Students will develop a deeper understanding of soil-water relationships and how they influence irrigation practices and water management.
- Students will be able to assess the efficiency and sustainability of irrigation systems, contributing to better water use in agricultural settings.

SEMESTER VI
THEORY

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PSH3201	Management (Common)	3	0	0	3
2	PCE3201	Contracts and Accounts	3	0	0	3
3	PCE3202	Environment Engineering	4	0	0	4
4	PCE3203	Design of Structures	4	0	0	4
5	PCE3204	Advanced Construction Techniques and Equipment	4	0	0	4

PRACTICAL

S. No.	Course Code	Course Title	Teaching Scheme Contact Hours per week			Credit
			L	T	P	
1	PCE3202P	Environment Engineering Lab	0	0	2	1
2	PCE3204P	Advanced Construction Techniques and Equipment	0	0	2	1
3	PCE3205	Civil Engineering Project	0	0	5	3
			Total			23

MANAGEMENT (COMMON)

Subject Code	Theory			Credits
	No.Of Period Per Week			
	L	T	P	3
PSH3201	3	0	0	
	-	-	-	

Course Objective:

- To introduce students to the fundamental concepts, theories, and functions of management.
- To examine the roles and responsibilities of managers in various organizational settings.
- To foster analytical thinking and decision-making abilities in real-world management scenarios.
- To provide tools for making informed, ethical, and strategic decisions.
- To explore the different types of organizational structures and their impact on management practices.

CONTENTS: THEORY

Unit 01: Overview of Business

1.1. Types of Business
- ➤ Service
- ➤ Manufacturing
- ➤ Trade

1.2. Industrial sectors Introduction to
- ➤ Engineering industry
- ➤ Process industry
- ➤ Textile industry
- ➤ Chemical industry
- ➤ Agro industry

1.3 Globalization
- ➤ Introduction
- ➤ Advantages & disadvantages w.r.t. India
- ➤ 1.4 Intellectual Property Rights (I.P.R.)

Unit 02: Management Process

2.1 What is Management?
- ➤ Evolution
- ➤ Various definitions
- ➤ Concept of management
- ➤ Levels of management
- ➤ Administration & management
- ➤ Scientific management by F.W.Taylor

2.2 Principles of Management (14 principles of Henry Fayol)

2.3 Functions of Management
- ➤ Planning

- ➢ Organizing

- Directing
- Controlling

Unit 03: Organizational Management

3.1 Organization:-
- Definition
- Steps in organization

3.2 Types of organization
- Line
- Line & staff
- Functional
- Project

3.3 Depart mentation
- Centralized & Decentralized
- Authority & Responsibility
- Span of Control

3.4 Forms of ownership
- Proprietorship
- Partnership
- Joint stock
- Co-operative Society
- Govt. Sector

Unit 04: Human Resource Management

4.1 Personnel Management
- Introduction
- Definition
- Functions

4.2 Staffing
- Introduction to HR Planning
- Recruitment Procedure

4.3 Personnel– Training & Development
- Types of training
- Induction
- Skill Enhancement

4.4 Leadership & Motivation
- Maslow's Theory of Motivation

4.5 Safety Management
- Causes of accident
- Safety precautions

4.6 Introduction to –
- Factory Act
- ESI Act
- Workmen Compensation Act

➢ Industrial Dispute Act

Unit 05: Financial Management

5.1. Financial Management- Objectives & Functions

5.2. Capital Generation & Management
- ➢ Types of Capitals
- ➢ Sources of raising Capital

5.3. Budgets and accounts
- ➢ Types of Budgets
- ➢ Production Budget (including Variance Report)
- ➢ Labour Budget
- ➢ Introduction to Profit & Loss Account (only concepts) ;

Balance Sheet

5.4 Introduction to –
- ➢ Excise Tax
- ➢ Service Tax
- ➢ Income Tax
- ➢ VAT
- ➢ Custom Duty

Unit 06: Materials Management

6.1. Inventory Management (No Numerical)
- ➢ Meaning & Objectives

6.2 ABC Analysis

6.3 Economic Order Quantity
- ➢ Introduction & Graphical Representation

6.4 Purchase Procedure
- ➢ Objects of Purchasing
- ➢ Functions of Purchase Dept.
- ➢ Steps in Purchasing

6.5 Modern Techniques of Material Management

Introductory treatment to JIT / SAP / ERP

Unit 07: Project Management (No Numerical)

7.1 Project Management
- ➢ Introduction & Meaning
- ➢ Introduction to CPM & PERT Technique
- ➢ Concept of Break Even Analysis

7.2 Quality Management
- ➢ Definition of Quality , concept of Quality , Quality Circle, Quality Assurance
- ➢ Introduction to TQM, Kaizen, 5 'S', & 6 Sigma

Course Outcome:

By the end of the course, students should be able to:

- Demonstrate an understanding of key management principles and theories.
- Apply these theories to solve practical problems in organizational settings.
- Make strategic decisions based on a clear understanding of organizational goals and available resources.
- Evaluate decision-making processes and outcomes critically, considering both short-term and long-term implications.
- Exhibit leadership and team-building skills that enhance productivity and morale.
- Use motivation techniques to drive team performance and encourage innovation.

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Industrial Engg & Management	Dr. O.P. Khanna	Dhanpal Rai & sons New
Business Administration & Management	Dr. S.C. Saksena	Sahitya Bhavan Agra
The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice- Hall
Industrial Management	Jhamb & Bokil	Everest Publication , Pune
Management	Deepak Chandra	Foundation Publishing
Industrial Organisation & Management	Banga & Sharma	Khanna Publication

CONTRACTS AND ACCOUNTS

Subject Code	Theory			Credits
	No.Of Period Per Week			
PCE3202	L	T	P	3
	3	-	0	
	-	-	-	

Course Objective:

- Learn the principles of contract law, including the formation, execution, and enforcement of contracts.
- Gain knowledge of key contract elements like offer, acceptance, consideration, and remedies for breach.
- Understand fundamental accounting principles, financial statements, and basic bookkeeping techniques.
- Develop skills in interpreting financial reports and assessing an organization's financial health.
- Understand the intersection between contracts and accounting in business transactions, ensuring legal and financial compliance.

CONTENTS: THEORY

Unit 01: Procedure of Execution of Work by P.W.D.

1.1 Organization of P.W.D.
- Functions of Their Personnel.

1.2 P.W.D. Procedure of Initiating the Work
- Administrative
- Approval
- Technical Sanction
- Budget Provision.

1.3 Methods Used In P.W.D. For Carrying Out Works
- Contract Method And Departmental Method
- Rate List Method
- Piece Work Method
- Day's Work Method
- Department Method (NMR and Casual Muster Roll.)

Unit 02: Contract

2.1 Definition of Contract
- Objects Of Contract
- Requirements Of Valid Contract

2.2 Types of Engineering Contract
- Lump Sum Contract
- Item Rate Contract
- Percentage Rate Contract

➤ Cost Plus Percentage,

- Cost Plus Fixed Fee
- Cost Plus Variable Percentage
- Cost Plus Variable
- Fee Contract
- Labour Contract
- Demolition Contract
- Fee Contract
- Target Contract
- Negotiated Contract.

2.3 Class of Contractor
- Registration of Contractor.

2.4 Bot Project

Unit 03: Tender & Tender Documents

3.1 Definition of Tender
- Necessity Of Tender
- Types-Local and Global.

3.2 Tender Notice
- Points To Be Included While Drafting Tender Notice
- Drafting Of Tender Notice.

3.3 Meaning of Terms:
- Earnest Money
- Security Deposit
- Validity Period
- Right To Reject One Or All Tender
- Corrigendum to Tender Notice and Its Necessity.

3.4 Tender Documents
- List
- Scheduled A
- Schedule B
- Schedule C.

3.5 Terms Related To Tender Documents
- Contract Conditions
- Time Limit
- Time Extension
- Penalty
- Defective Material And Workmanship
- Termination Of Contract
- Suspension Of Work
- Subletting Of Contract
- Extra Items
- Escalation
- Arbitration
- Price Variation Clause

➢ Defect Liability Period

➢ Liquidated and Unliquidated Damages.

3.6 Filling The Tender By Contractor And Points To Be Observed By Him.

3.7 Procedure of Submitting Filled In Tender Document
➢ Procedure Of Opening Tender
➢ Comparative Statement
➢ Scrutiny Of Tenders
➢ Award Of Contract
➢ Acceptance Letter and Work Order.

3.8 Unbalanced Tender, Ring Formation

Unit 04: Accounts in P.W.D.

4.1 Various Account Forms and Their Uses
➢ Measurement Books
➢ Nominal Muster Roll
➢ Imprest Cash
➢ Indent
➢ Invoice
➢ Bills
➢ Vouchers
➢ Cash Book
➢ Temporary Advance

Unit 05: Payment to Contractors

5.1 Mode of Payment to the Contractor
➢ Interim Payment And Its Necessity
➢ Advance Payment
➢ Secured Advance
➢ On Account Payment
➢ Final Payment
➢ First And Final Payment
➢ Retention Money
➢ Reduced Rate Payment
➢ Petty Advance
➢ Mobilization Advance

Unit 06: Specifications

6.1 Necessity and Importance of Specifications of an Items
➢ Points To Be Observed In Framing Specifications Of An Item
➢ Types Of Specification
• Brief And Detailed
• Standard
• Manufacturers Specification.

6.2 Preparing Detailed Specifications of Items in Civil Engineering Works. Standard Specification Book.

6.3 Legal Aspects of Specification

Unit 07: Valuation

7.1 Definition
- ➢ Necessity Of Valuation
- ➢ Definitions –
  - • Cost Price
  - • Value
  - • Difference Between Them
  - • Characteristics Of Value
  - • Factors Affecting Value.

7.2 Types of Value: -
- ➢ Book Value
- ➢ Scrap Value
- ➢ Salvage Value
- ➢ Speculative Value
- ➢ Distress Value
- ➢ Market Value
- ➢ Monopoly Value
- ➢ Sentimental Value
- ➢ Factors Affecting Value.

7.3 Depreciation
- ➢ Obsolescence
- ➢ Sinking Fund.
- ➢ Methods Of Calculation Of Depreciation
- ➢ Straight Line Method
- ➢ Sinking Fund Method
- ➢ Constant Percentage Method
- ➢ Quantity Survey Method.

7.4 Computation of Capitalized Value
- ➢ Gross Income
- ➢ Outgoing
- ➢ Net Income
- ➢ Years Purchase
- ➢ Types of Outgoing and Their Percentages.

7.5 Valuation of Lands & Buildings
- ➢ Factors Affecting Their Valuation
- ➢ Book Value Method
- ➢ Replacement Value Method
- ➢ Comparison Method
- ➢ Use Of Valuation Tables
- ➢ Deferred Value Of Land.

7.6 Fixation of Rent as Per PWD Practice

Course Outcome:

- Ability to analyze, interpret, and draft legally sound contracts for various business scenarios.
- Assess and apply legal remedies for breaches of contract, including damages and specific performance.
- Accurately prepare and interpret key financial statements such as balance sheets, income statements, and cash flows.
- Record and analyze business transactions using appropriate accounting methods like double-entry bookkeeping.
- Demonstrate ethical behavior in both contract law and accounting practices, ensuring transparency and legal compliance.

Text /Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Estimating & Costing In Civil Engineering	B.N. Datta	UBS Publishers
Estimating & costing, Specification and Valuation in Civil Engineering	M. Chakraborti	M. Chakraborti , Calcutta
Estimating & costing	S.C. Rangwala	Charotar Publication
ESTIMATING & COSTING	G. S. Birdie	Dhanpat Rai and Sons
Contracts and Accounts	S.P. Khattar	Foundation Publishing

ENVIRONMENTAL ENGINEERING

Subject Code	Theory			Credits
	No.Of Period Per Week			
PCE3203	L	T	P	
	3	0	2	4
	-	-	-	

Course Objective:
- Learn the fundamental principles of environmental science and engineering, including the impact of human activities on natural systems.
- Develop skills to design and implement systems for air, water, and soil pollution control and waste management.
- Promote sustainable practices in environmental design, resource management, and waste treatment technologies.
- Understand environmental laws, regulations, and ethical responsibilities related to environmental engineering practices.
- Equip students with the problem-solving skills to address contemporary environmental challenges, such as climate change, water scarcity, and waste management.

CONTENTS: THEORY

Unit 01: ENVIRONMENTAL POLLUTION AND CONTROL

1.1 Introduction
- ➢ Environment
- ➢ Ecosystem
- ➢ Environmental Pollution and its types
- ➢ Causes of Pollution
- ➢ Effects of Pollution
- ➢ Control of Pollution
- ➢ Existing laws related to Environmental Pollution

Unit 02: PUBLIC WATER SUPPLY
2.1 Quantity of Water
- ➢ Demands of water:
  - Domestic
  - Industrial
  - Commercial & Institutional
  - Public use
  - Losses and wastes
- ➢ Fire demand:
  - Factors affecting rate of Demand
  - Variations of water demand
- ➢ Forecasting of population

➢ Methods of forecasting of population

- Design period for water supply scheme.
- Estimation of quantity of water supply required for a town or city
- Types of water supply schemes.

2.2 Sources of Water
- Surface and Subsurface sources of water
- Intake Structures
  - Definition and types
  - Factors governing the location of an intake structure
- Water conservation
  - Ground water recharging – Necessity Importance and advantages.

2.3 Quality of Water
- Need for analysis of water
- Characteristics of water
  - Physical
  - Chemical
  - Biological
- Testing of water for Total solids,
  - Hardness
  - Chlorides
  - dissolved Oxygen
  - pH
  - Fluoride
  - Nitrogen and its compounds
  - Bacteriological tests
  - E coli index
  - MPN
  - Sampling of water
  - Water quality standards as per I.S

2.4 **Purification of Water**
- Screening
  - Types of screens
- Aeration
  - objects and methods of aeration
- Plain sedimentation
- Sedimentation with coagulation
  - principles of coagulation
  - types of coagulants
  - Jar Test
  - process of coagulation
  - types of sedimentation tanks
- Filtration
  - theory of filtration

- classification of filters :

- slow sand filter
- rapid sand filter
- pressure filter
- domestic filter
- filter media
- construction and working of slow sand filter and rapid sand filter
- Disinfection:
  - Objects
  - methods of disinfection
- Chlorination
  - Application of chlorine
  - forms of chlorination
  - types of chlorination practices
  - residual chlorine and its importance orthotolidine test
- Miscellaneous water Treatments (Water softening, Defluoridation techniques)
  - Advanced Water Treatments (Electrolysis, Reverse Osmosis)
  - Flow diagram of water treatment plants
- Low cost water Treatments:
  - Necessity and importance in rural areas
  - Prevention of pollution of bores and bore wells.

2.5 Conveyance and Distribution of Water:
- Types of Pipes used for conveyance of water
- choice of pipe material
- Types of joints & Types of valves- their use, location and function on a pipeline
- Methods of distribution of water- Gravity, pumping, and combined system
- Service reservoirs –functions and types
- Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system their suitability, advantages and disadvantages

Unit 03: DOMESTIC SEWAGE
3.1 Introduction
- Importance and necessity of sanitation
- Necessity to treat domestic sewage
- Recycling and Reuse of domestic waste
- Definitions- Sewage, sullage, types of sewage

3.2 Building Sanitation
- Definitions of the terms related to Building Sanitation-
  - Water pipe
  - Rain water pipe
  - Soil pipe
  - Sullage pipe
  - Vent pipe
- Building Sanitary fittings

➤ Water closet:

- Indian and European type
- flushing cistern
- wash basin
- sinks
- Urinals
  - Traps:
    - types
    - qualities of good trap
  - Systems of plumbing:
    - one pipe
    - two pipe
    - single stack
  - choice of system Principles regarding design of building drainage
    - layout plan for building sanitary fittings (drainage plan)
    - inspection and junction chambers, their necessity, location, size and shape
    - Maintenance of sanitary units.

3.3 Systems of Sewerage
  - Types of Sewers
  - Systems of Sewerage
  - Design of sewers
  - Self-cleansing velocity and non-scouring velocity Laying
  - Testing and maintenance of sewers.

3.4 Sewer Appurtenances
  - Manholes and Drop Manhole-component parts, ,location, spacing, construction details, Sewer Inlets , Street Inlets
  - Flushing Tanks – manual and automatic

3.5 Analysis of Sewage
  - Characteristics of sewage
  - B.O.D./ C.O.D and significance.
  - Aerobic and anaerobic process
  - Maharashtra Pollution Control Board Norms for the discharge of treated sewage

3.6 Treatment of Sewage
  - Objects of sewage treatment
  - General layout and flow diagram
    - Screening
    - Grit removal
    - Skimming
    - Sedimentation of sewage
    - Sludge digestion
    - Trickling filters
    - Activated sludge process,
  - Disposal of sewage
    - Septic tank

- Oxidation pond

- Oxidation ditch

Unit 04: INDUSTRIAL WASTE
4.1 Industrial Waste Water Characteristics of Industrial waste water from sugar
  - Dairy, Distillery, Textile, Paper and Pulp and Oil industry; and their suggestive treatments

Unit 05: ENVIRONMENTAL POLLUTION
5.1 Air Pollution and Noise Pollution Sources
  - Effects and Control of Air Pollution
  - Sources
  - Effects and Control of Noise Pollution (only brief idea)
  - Global warming
  - Acid Rain

Unit 06: SOLID WASTES FROM THE SOCIETY
6.1 Solid Waste Management
  - Definitions
    - Refuse
    - Rubbish
    - Garbage
    - Ashes
  - Constituents of solid wastes
  - Sources of solid wastes
  - Collection of Solid Wastes
  - Methods of collection of solid wastes
  - Methods of treatment and disposal of solid waste.
6.3 Hazardous Wastes
  - Introduction
  - Types of hazardous wastes
  - Characteristics of hazardous wastes
  - Treatment and disposal of hazardous wastes

Unit 07: ENVIRONMENTAL SANITATION
7.1 Environmental Sanitation
  - Necessity and importance
  - Rural sanitation
    - Types of Privies – Aqua privy and Bore Hole Latrine- construction and working Composting (Nadep or Vermiculture),
7.2 Emerging Trends (only brief idea) ant Gadge Baba Swachhatha Abhiyan Low cost latrines Jalswarajya Scheme

Unit 08: PLUMBING
8.1 Sanitary Plumbing

➢ Layout

- ➢ Details of water supply arrangement for residential and public building Rainwater and sewage collection systems

Course Outcome:
- Ability to collect, analyze, and interpret environmental data to assess pollution levels and environmental risks.
- Design and evaluate effective treatment systems for air, water, and wastewater to reduce environmental impact.
- Apply sustainable engineering practices in resource management, energy efficiency, and waste reduction strategies.
- Understand and apply environmental laws, codes, and standards to ensure compliance in engineering practices.
- Create comprehensive environmental management plans that balance economic, environmental, and social considerations.

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Environmental Engineering (Volume I & II)	Santosh kr. Garg	Khanna Publishers
Environmental Engineering	Kamla A. & Kanth Rao D. L.	Tata McGraw Hill
Water Supply and Sanitary Engineering	Birdie G. S. Birdie J. S.	Dhanpat Rai & Sons
Air Pollution	Rao M. N. Rao H. V. N.	Tata McGraw Hill,
Environment Engineering	Rahul Sinha	Foundation Publishing

DESIGN OF STRUCTURES

Subject Code PCE3204	Theory			Credits
	No.Of Period Per Week			
	L	T	P	3
	3	0	0	
	-	-	-	

Course Objective:

- Learn the fundamental principles of structural analysis, including the behavior of structures under various loads and forces.
- Familiarize students with the design codes, standards, and materials used in structural engineering (e.g., steel, concrete, wood).
- Develop skills to design safe, stable, and efficient structural elements, including beams, columns, slabs, and foundations.
- Emphasize safety considerations, sustainability, and material efficiency in structural design.
- Equip students with the ability to use modern engineering software for structural design, analysis, and simulation.

CONTENTS: THEORY

Unit 01: Working Stress Method & Prestressed Concrete

1.1 Introduction to reinforced concrete
  - ➢ R.C. Sections their behavior
  - ➢ grades of concrete steel
  - ➢ Permissible stresses
  - ➢ Assumptions in W.S.M.

1.2 Equivalent bending stress distribution diagram for singly reinforced section

1.3 Concept of prestressed concrete, externally and internally prestressed member.

1.4 Advantages and disadvantages of prestressed concrete.

1.5 Methods of prestressing, pretensioning and post tensioning
  - ➢ Losses in prestressing (No numerical problems shall be asked in written examination on pre-stressed concrete)

Unit 02: Limit State Method

2.1 Definition
  - ➢ types of limit states
  - ➢ partial safety factors for materials strength
  - ➢ characteristic strength
  - ➢ characteristic load
  - ➢ design load
  - ➢ Loading on structure as per I.S 875.

2.2 I.S. Specification regarding spacing of reinforcement in slab cover to reinforcement in slab, beam column &Footing.

- ➢ Minimum reinforcement in slab, beam & column, lapping, anchoring effective span for beam, & slab

Unit 03: Analysis and Design of Singly Reinforced Sections (LSM)
3.1 Limit State of collapse (Flexure)
- ➢ Assumptions
- ➢ Stress - strain relationship for concrete and steel
- ➢ Neutral axis
- ➢ Stress block diagram and Strain diagram for singly reinforced section.

3.2 Concept of under- reinforced, over-reinforced and balanced section
- ➢ Neutral axis co-efficient
- ➢ Limiting value of moment of resistance
- ➢ Limiting percentage of steel required for balanced singly R.C. Section.

3.3 Simple numerical problems on determining design constants, moment of resistance and area of steel

Unit 04: Analysis and Design of Doubly Reinforced Sections (LSM)
4.1 General features
- ➢ Necessity of providing doubly reinforced section reinforcement limitations.

4.2 Analysis of doubly reinforced section
- ➢ Strain Diagram
- ➢ Stress Diagram
- ➢ Depth Of Neutral Axis
- ➢ Moment of Resistance of the Section.

4.3 Simple numerical problems on finding moment of resistance and design of beam sections

Unit 05: SHEAR BOND AND DEVELOPMENT LENGTH (LSM)
5.1 Nominal Shear stress in R.C Section
- ➢ Design shear strength of concrete
- ➢ Maximum shear stress
- ➢ Design of shear reinforcement
  - Minimum shear reinforcement
  - Forms of shear reinforcement.

5.2 Bond and types of bond
- ➢ Bond Stress
  - check for bond stress
- ➢ Development length in tension and compression
- ➢ Anchorage value for hooks 90° bend and 45° bend Standard Lapping of bars
- ➢ Check for development length.

5.3 Simple numerical problems on deciding whether shear reinforcement is required or not
- ➢ check for adequacy of the section in shear
- ➢ Design of shear reinforcement; Minimum shear reinforcement in beams
- ➢ Determination of Development length required for tension reinforcement of cantilevers beam and slab
- ➢ Check for development length.

Unit 06: Analysis and Design of T-Beam (LSM)

6.1 General features, advantages, effective width of flange as per IS :456-2000 code provisions.

6.2 Analysis of singly reinforced T-Beam
  - ➢ strain diagram & stress diagram
  - ➢ depth of neutral axis
  - ➢ moment of resistance of T-beam Section with neutral axis lying within the flange

6.3 Design of T-beam for moment and shear for Neutral axis within or up to flange bottom.

6.4 Simple numerical problems on deciding effective flange width.

(Problems only on finding moment of resistance of T-beam section with N. A. lies within or upto the bottom of flange shall be asked in written examination)

Unit 07: Design of Slab (LSM)

7.1 Design of simply supported one-way slabs for flexure check for deflection control, and shear.

7.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear.

7.3 Design of two-way simply supported slabs for flexure with corner free to lift.

7.4 Design of dog-legged staircase.

7.5 Simple numerical problems on design of one-way simply supported slabs cantilever slab & two-way simply supported slab.

 (No problem on design of dog-legged staircase shall be asked in written examination.)

Unit 08: Design of Axially Loaded Column and Footing (LSM)

8.1 Assumptions in limit state of collapse – compression

8.2 Definition and classification of columns
  - ➢ effective length of column
  - ➢ Specification for minimum reinforcement cover,maximum reinforcement
  - ➢ number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.

8.3 Analysis and design of axially loaded short, square, rectangular and circular columns with lateral ties only check for short column and check for minimum eccentricity may be applied.

8.4 Types of footing
  - ➢ Design of isolated square footing for flexure and shear.

8.5 Simple numerical problems on the design of axially loaded short columns and isolated square footing. (Problems on design of footing shall be asked in written examination for moment and two way shear only)

Course Outcome:

- Ability to analyze various structural systems, determining internal forces, moments, and deflections under different loading conditions.
- Design structural components like beams, columns, slabs, and foundations using appropriate materials and design codes.
- Ensure the safety, stability, and serviceability of structures by applying strength and stability criteria in the design process.
- Effectively apply relevant national and international design codes and standards in structural

design and analysis.

- Demonstrate proficiency in using design and analysis software tools to model and simulate structural behavior, enhancing design accuracy and efficiency.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Limit State Theory & Design of Reinforced Concrete	Dr. V. L. Shah & Late Dr. S. R.Karve	Structures Publications
Fundamentals of Reinforced Concrete	N. C. Sinha & S. K. Roy	S. chand & Company,
Prestressed Concrete	N. Krishna Raju	--------
Reinforced concrete Design	S.U.Pillai & Devdas Menon	Tata Mcgraw Hill
Limit State Design of Reinforced Concrete	P. C. Varghase	Prentice Hall of India
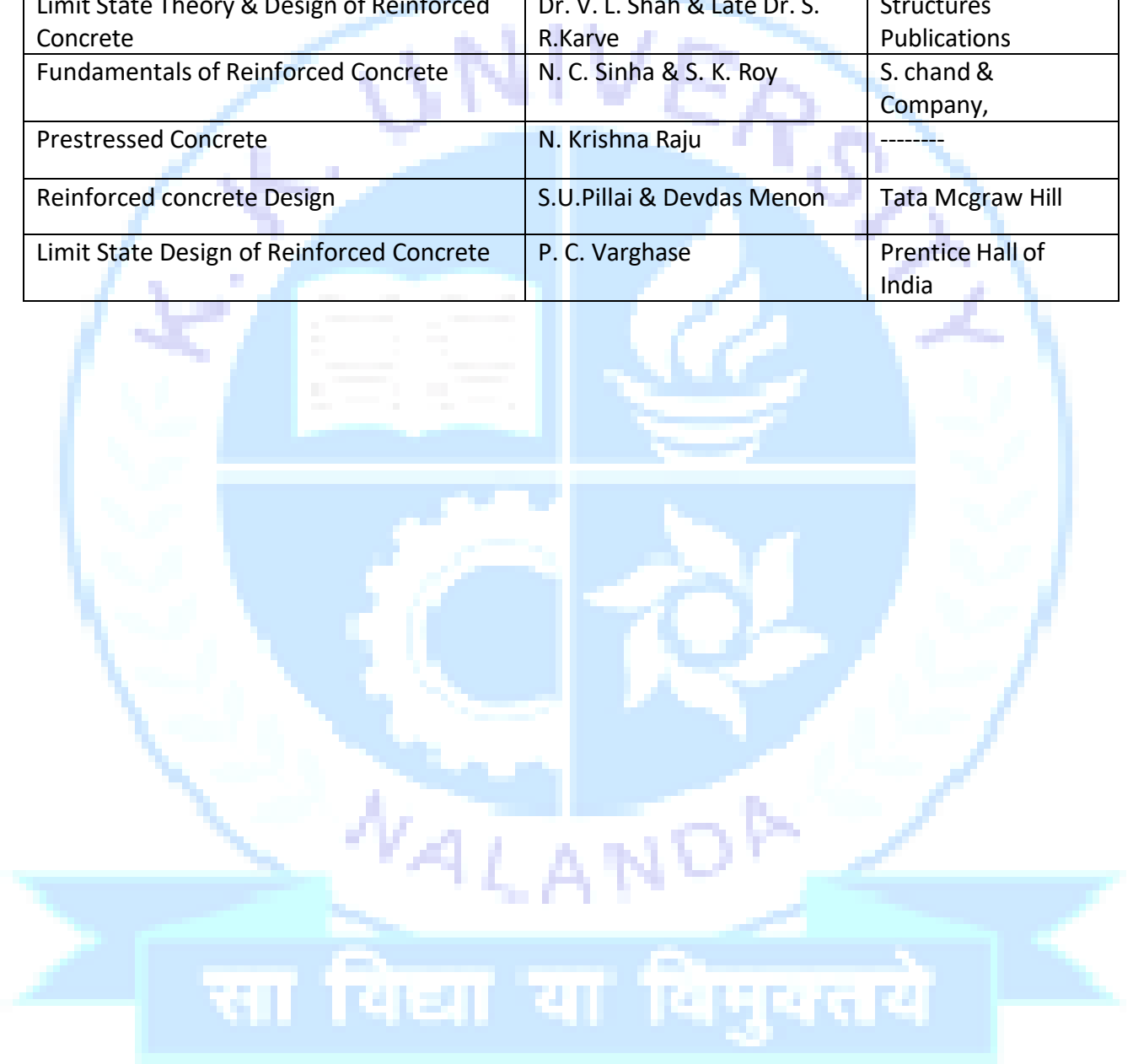
ELECTIVE (ANY ONE) – (I) ADVANCED CONSTRUCTION TECHNIQUES & EQUIPMENTS

Subject Code	Theory			Credits
	No. Of Period Per Week			
PCE3205	L	T	P	4
	3	1	2	
	-	-	-	

Course Objective:
- Learn about innovative construction techniques and materials, including modern methods of construction (MMC), prefabrication, and modular construction.
- Gain knowledge of advanced construction equipment, machinery, and technologies used in large-scale projects such as cranes, excavators, and automated systems.
- Understand project management practices, including cost estimation, scheduling, and logistics, for complex construction projects.
- Emphasize sustainable construction practices, energy-efficient technologies, and safety protocols in the use of construction equipment and techniques.
- Study the role of technology, automation, and digital tools (e.g., BIM, drones, 3D printing) in enhancing construction processes and project delivery.

CONTENTS: THEORY

Unit 01: Advanced Construction Materials

1.1 FIBERS AND PLASTICS
- ➤ Types of fibers – Steel, Carbon, Glass fibers
- ➤ Use of fibers as construction materials
- ➤ Properties of fibers
- ➤ Types of Plastics – PVC, RPVC, HDPE, FRP, GRP etc.
- ➤ Colored plastic sheets
- ➤ Use of plastic as construction Material.

1.2 Artificial Timber
- ➤ Properties and uses of artificial timber
- ➤ Types of artificial timber available in market
- ➤ strength of artificial timber.

1.3 Miscellaneous materials
- ➤ Properties and uses of acoustics materials
  - • Wall claddings
  - • Plaster boards
  - • Micro-silica
  - • Artificial sand
  - • Bonding agents
  - • Adhesives

Unit 02: Advanced Concreting Methods

2.1 Prestressed Concrete

➢ Grades of Concrete and prestressing cables for prestressed concrete

- Methods of pre-tensioning and post tensioning
- Equipment and accessories for prerstressing
- Precautions during prestressing of members.

2.2 Under water Concreting
- Underwater concreting for bridge piers and bored pile construction
- Tremy method of underwater concreting
- Procedure and equipment required for tremy method
- Properties, workability and water cement ratio of the concrete required.

2.3 Ready Mix concrete
- Necessity and use of Ready Mix Concrete
- Production and equipment's for RMC.
- Ready Mix Concrete plant.
- Conveying of RMC. Transit mixers- working and time of transportation
- Workability and water cement ratio for RMC.
- Strength of RMC.

2.4 Tremix Concreting method
- Definition, application of vacuum dewatering concreting
- Equipment used in tremix concreting
- Procedure of vacuum dewatering concreting (Tremix).

2.5 Special Concretes
- Properties, uses and procedure of Roller compacted concrete.
- Properties and uses of High Impact Resisting concrete.
- Properties, uses and constituents of Steel fiber reinforced concrete.
- Percentage of steel fibers in SFRC. Effect of size, aspect, ratio and percentage of steel fibers on strength of concrete

Unit 03: Advanced Construction Methods.

3.1 Formwork
- Steel Formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork.
- Slip formwork- meaning, use of slip formwork. Process of concreting with slip forms.

3.2 Construction of Multistoried Buildings
- Use of lifts, belt conveyors, Pumped concrete
- Equipments and machinery required for construction of Multistoried Buildings
- Precautions and safety measures.

3.3 Prefabricated Construction
- Meaning of prefabrication and precast
- Methods of prefabrication- plant prefabrication and site prefabrication
- Linear members, rigid frames, roofing and flooring members
- R.C. Doors and windows, wall panels, Jointing of structural members.

3.4 Soil Reinforcing techniques
- Necessity of soil reinforcing
- Use of wire mesh and geo-synthetics.
- Strengthening of embankments

- slope stabilization in cutting and embankments by soil reinforcing techniques

Unit 04: Hoisting and Conveying Equipments

4.1 Hoisting Equipments
  - Principle and working of Tower cranes, Crawler cranes, Truck mounted cranes, gantry cranes, Mast cranes, Derricks.

4.2 Conveying Equipments
  - Working of belt conveyors
  - Types of belts and conveying mechanism.
  - Capacity and use of dumpers, tractors and trucks

Unit 05: Earth Moving machinery

5.1 Excavation Equipments
  - Use f equipments
  - Working and output of bulldozers, scrapers, graders, and power shovels, JCB, draglines.

5.2 Compacting Equipments
  - Use of rollers
  - Roller types- Plain rollers, Sheep footed rollers, Vibratory rollers, pneumatic rollers. Rammers- use and working

Unit 06: Concreting Equipments

6.1 Concrete Mixers
  - Types of concrete mixers
  - Weigh batching equipments,
  - Equipments for transportation of concrete- trollies, lifts
  - Transit mixers, Concrete vibrator- Needle vibrators, Screed vibrators.
  - Automatic concrete plants – layout, process and working.

6.2 Stone Crushers
  - Types of stone crushers
  - capacities and working. Equipments for production of artificial sand

Unit 07: Miscellaneous Equipments and Equipment management

7.1 Miscellaneous Equipments
  - Pile driving equipment
  - Pile hammers, selection of hammers
  - Working of hot mix bitumen plant
  - Bitumen paver
  - Grouting equipments, Floor polishing machine.

7.2 Equipment Management
  - Standard equipment
  - Special equipment
  - Selection of equipment
  - Owning and operating cost of construction equipment
  - Economic life of construction equipment
  - Preventive maintenance of equipment

➢ Break down maintenance of equipments

Course Outcome:

- Ability to apply advanced construction methods and materials to enhance the efficiency, quality, and sustainability of construction projects.
- Demonstrate knowledge and proficiency in the operation and selection of advanced construction equipment for various project needs.
- Use project management tools and techniques to manage construction timelines, costs, and resources effectively in complex projects.
- Integrate safety protocols and sustainable construction practices into equipment operation and project execution.
- Leverage digital tools and technologies, such as BIM, drones, and automation, to improve project design, coordination, and execution.

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Construction Technology Vol. I to IV	R. Chudly	ELBS- Longman Group
Construction Planning equipment and methods	R.L. Peurifoy	McGraw-Hill Co. Ltd
Concrete Technology(Third Edition	M. L. Gambhir	Tata McGraw Hill
Materials of construction	R. C. Smith	McGraw-Hill Co. Ltd.
Construction Planning and Equipment	R. Satyanarayana and S. C. Saxena	Standard Publication New Delhi
Construction of structures and Management of Works	S. C. Rangawala	Charotar Publication

ENVIRONMENT ENGINEERING LAB

Subject Code	Theory			Credits
	No.Of Period Per Week			
PCE3203P	L	T	P	
	0	0	3	2
	-	-	-	

Course Objective:
- Equip students with hands-on experience in testing air, water, and soil samples for environmental quality assessment.
- Familiarize students with the operation of common environmental engineering laboratory equipment used for pollution monitoring and analysis.
- Teach students to collect, analyze, and interpret environmental data to identify pollution levels and potential health risks.
- Enable students to design and conduct experiments that address real-world environmental challenges, using appropriate scientific methods.
- Emphasize laboratory safety, ethical practices, and proper data reporting to ensure the integrity and accuracy of experimental results.

CONTENTS: PRACTICAL

Skills to be developed:
- ❖ Intellectual Skills:
    1. Identify the method for testing of water.
    2. Interpret the results.
- ❖ Motor Skills:
    1. Observe chemical reactions
    2. Handle instruments carefully
- ❖ List of Practical:
- Water Supply Engineering:
    1. To determine fluoride concentration in given water sample
    2. To determine the turbidity of the given sample of water.
    3. To determine residual chlorine in a given sample of water.
    4. To determine suspended solids, dissolved solids, and total solids of water sample
    5. To determine the dissolved oxygen in a sample of water.
    6. To determine the optimum dose of coagulant in the given sample by jar test.
- Sanitary Engineering:
    1. To determine the dissolved Oxygen in a sample of waste water.
    2. To determine B.O.D. of given sample of waste water.
    3. To determine C.O.D. of given sample of waste water.
    4. To determine suspended solids, dissolved solids and total solids of waste water sample.
    5. Design the Septic Tank for the public building such as hostel or hospital.
   6. Draw Plan and Section of the same along with the drainage arrangement in soak pit.

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7. To determine various pollutant levels in the atmosphere using Digital Air Volume Sampler.
    a) Energy generation plants from solid wastes.
    b) Energy generation plants from Gobar Gas.

Course Outcome:
- Demonstrate the ability to conduct standard environmental tests for water quality, air quality, and soil contamination.
- Proficiently operate environmental engineering laboratory instruments, such as turbidity meters, spectrophotometers, and water samplers.
- Analyze and interpret laboratory results to assess environmental conditions and recommend appropriate pollution control measures.
- Follow proper safety protocols and ensure accurate and reliable data collection, handling, and reporting in lab experiments.
- Communicate experimental results effectively, preparing clear reports and presenting findings for potential applications in environmental management.
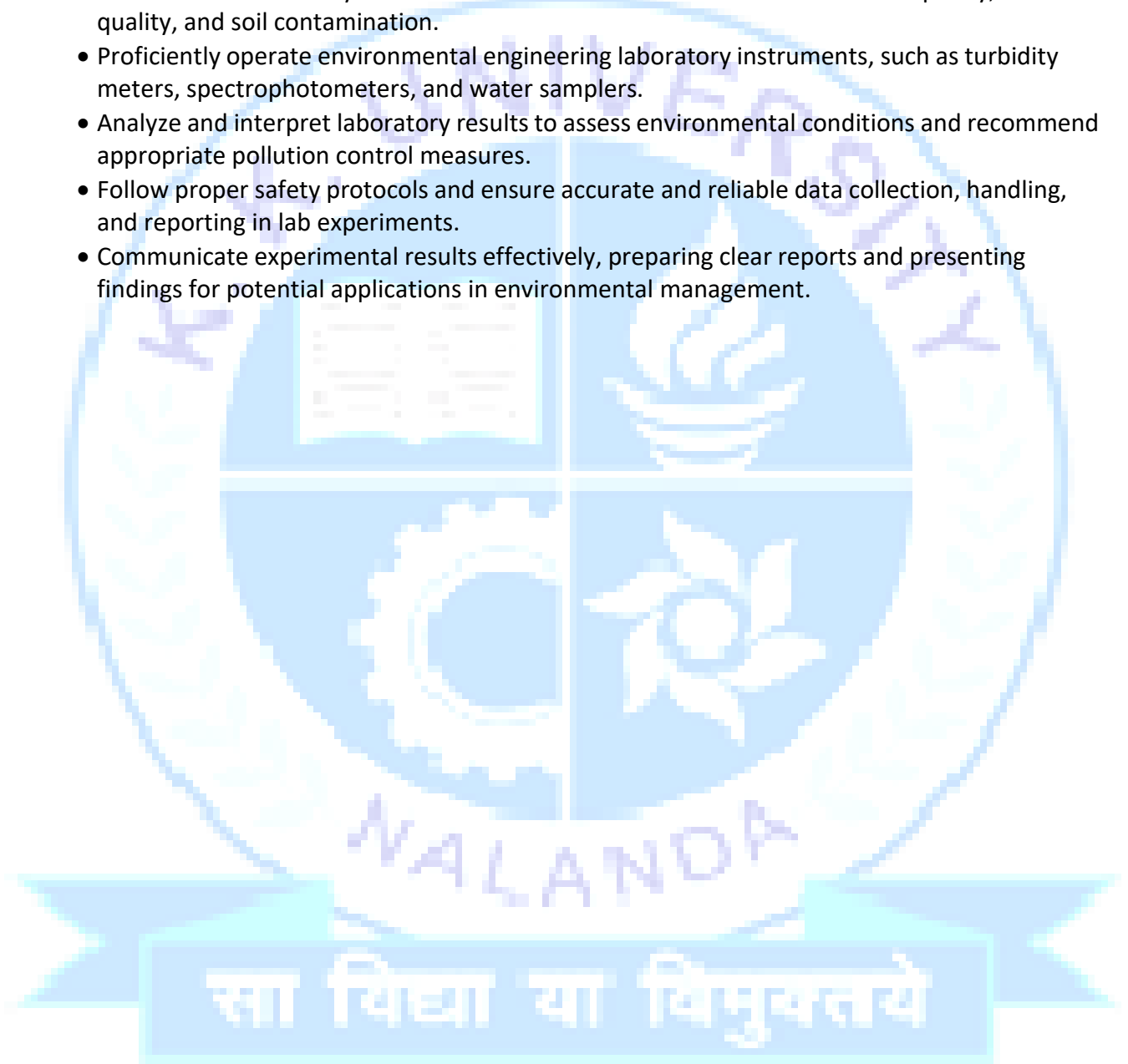
ELECTIVE (ANY ONE) – (I) ADVANCED CONSTRUCTION TECHNIQUES AND EQUIPMENTS LAB

Subject Code	Theory			Credits
	No. Of Period Per Week			
	L	T	P	
PCE3205P	0	0	2	1
	-	-	-	

Course Objective:

- Provide students with practical experience in operating and maintaining advanced construction machinery such as cranes, excavators, and loaders.
- Familiarize students with cutting-edge construction techniques like 3D printing, modular construction, and automated machinery.
- Teach students how to select and utilize the appropriate construction equipment for various tasks and project requirements.
- Emphasize safe practices when working with construction equipment and advanced techniques to ensure personal safety and project efficiency.
- Analyze Equipment Performance: Develop skills to analyze the performance, productivity, and efficiency of various construction techniques and equipment in real-world scenarios.

CONTENTS: PRACTICAL

Skills to be developed:

- ❖ Intellectual Skills:
    1. know the new materials of construction.
    2. get acquainted with advanced methods of construction.
    3. Select suitable construction equipments for execution of various constructions activities.
- ❖ List of Practical:
    1. Collect Specifications/ properties of at least five advanced materials of construction and write the report on the same.
    2. Writing report on Tremie method of concreting for piles/ Bridge piers.
    3. Finding effect of size of fibers and aspect ratio (l/d ratio) of steel fibers on the strength of steel fiber reinforced concrete.
    4. Finding effect of percentage of steel fibers on the strength of steel fiber reinforced concrete.
    5. Writing a report on method of preparation and conveyance of ready mix concrete.
    6. Writing a report on working and output of any three earth moving machinery.
    7. Observing at site/ Video/ LCD demonstration of bitumen paver and writing report of the process and equipments observed.
    8. Preparing a detailed account of types, numbers and drawings of steel formwork required for a two-storied framed structured residential building.

Course Outcome:

- Demonstrate proficiency in operating advanced construction machinery, including cranes, excavators, and concrete pumps.
- Apply innovative construction techniques such as modular construction, 3D printing, and automated equipment in a lab environment.
- Make informed decisions on the selection of construction equipment based on project requirements, terrain, and job site conditions.
- Follow safety protocols and best practices when operating construction equipment to minimize risks and ensure safe working conditions.
- Assess the performance and efficiency of construction equipment, making recommendations for optimization in terms of cost, productivity, and sustainability.