THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV301T	Applied Mathematics - III	4	-	-	4	30	70	100

Course Objectives	Course Outcomes
The goal of this paper is to: 1. Equip students with Advanced Mathematical Skills of Engineering that would enrich logical thinking power. 2. Introduce essential concepts of computational and optimization techniques for effective understanding Civil Engineering subjects.	At the end of the course, students will be able to: 1. Analyze and solve various practical problems by Numerical Computational methods. 2. Evaluate problems of P.D.E: Application of vibration of string and beams. 3. Learn the concept of finding maxima and minima of definite integral involving unknown function and its derivatives. 4. Implement concept of Matrices and Eigen value problem and to solve Differential Equations. Form mathematical model corresponding to engineering problems by using Matrices. 5. Formulate simple optimization problem and learn to solve it by Graphical method and Simplex method.

Unit I **[10 Hrs]**

NUMERICAL METHODS: Solution of Algebraic and Transcendental Equations: Method of False Position, Newton–Raphson method, Solution of system of simultaneous linear equations: Crout's method and Gauss Seidel method, Numerical solution of ordinary differential equation: Taylor's series method, Runge- Kutta 4th order method. Euler's modified method, Milne's Predictor- Corrector method, Largest Eigen value and Eigen vector by Iteration method.

Unit II **[8 Hrs]**

PARTIAL DIFFERENTIAL EQUATIONS: Partial Differential Equations of first order first degree i.e. Lagrange's form, Linear Homogeneous Equations of higher order with constant coefficients. Method of separations of variables, Applications to simple problems of vibration of strings and beams.

Unit III **[5 Hrs]**

CALCULUS OF VARIATIONS: Maxima and minima of functional, Euler's equation, Functionals dependent on First & Second orders derivatives. Rayleigh-Ritz method, Simple applications.

Unit IV **[7 Hrs]**

MATRICES: Linear dependence of vectors, Characteristics equation, Eigen values and Eigen vectors, Reduction to Diagonal form, Sylvester's theorem (without proof), Solution of Second Order Linear Differential Equation with constant Coefficients by Matrix Method.

Unit V **[5 Hrs]**

INTRODUCTION TO OPTIMIZATION TECHNIQUES: Linear programming problem: Formulation, Graphical method, Simplex method, Transportation Problems and its simple applications.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Higher Engineering Mathematics	B. S. Grewal	40th	Khanna Publishers, New Delhi.
2	Applied Mathematics for Engineers & Physicist	L.A. Pipes and L.R. Harville	-	-
3	Advanced Engineering Mathematics	Erwin Kreyszig	-	John Wiley & Sons, New York.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Higher Engineering Mathematics	B. V. Ramana	-	Tata McGraw-Hill Publications, New Delhi.
2	Introductory methods of Numerical Analysis	S. S. Sastry	-	Prentice Hall of India
3	Calculus of Variation	Forrey	-	-
4	A textbook of Engineering Mathematics	N. P. Bali & M. Goyal	-	Laxmi Publication

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV302T	Solid Mechanics	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1. To learn the fundamental principles of strength of materials. 2. To calculate stresses, strains and deformations of structural elements under the external forces.	At the end of the course, the students will be able to- 1. Recognize the concepts of stress and strain for deformable bodies 2. Sketch shear force & bending moment diagrams for beams. 3. Compute bending stress, shear stresses and deflection for a beam under various loads. 4. Understand the shear stress distribution within shafts subjected to torsion. 5. Compute combined stresses for structural members and sketch Mohr's circle of stress.

Unit I **[11 Hrs]**

Concept of simple stresses and strains: Introduction, stress, strain, types of stresses, stress and strain diagram for brittle & ductile material, elastic limit, Hooks law, modulus of elasticity, modulus of rigidity, factor of safety, analysis of tapered rod, analysis of composite section, thermal stress and strain. Longitudinal strain & stress, lateral stresses and strains, Poisson's ratio, volumetric stresses and strain with uni-axial, bi-axial & tri-axial loading, bulk modulus, relation between Young's modulus and modulus of rigidity, Poisson's ratio and bulk modulus. Basic concepts used in design of pressure vessels.

Unit II **[9 Hrs]**

Shear force and bending moment: Types of beam (cantilever beam, simply supported beam, overhung beam etc.). Types of loads (Concentrated and UDL), shear force and bending moment diagrams for different types of beams subjected to different types of loads as well as couple. Relation between load and shear force and bending moment.

Unit III **[11 Hrs]**

Bending stresses in simple beams, assumptions and derivations of simple bending theory, relation between bending moment, bending stress and curvature, homogenous and composite beams Shear stress in simple beams, shear flow and shear stress distribution. Combined effect of BM and shear force. Section modulus for various shapes of beam sections.
Deflection of beams: Derivation of differential equation of elastic curve with the assumptions made in it. Deflection and slope of cantilever, simply supported, overhung beams subjected to concentrated load UDL, Relation between slope, deflection and radius curvature in Macaulay's method to determine deflection of beam. Buckling of columns and strut columns. Euler's and Rankine's formula.

Unit IV **[6 Hrs]**

Torsion of circular sections, assumptions and derivation of relations between torsional moment, shear stress and angle of twist, Torsional stress in solid circular sections, torsion in thin walled hollow sections closely coiled, helical spring, Leaf spring. Introduction of torsion in rectangular section.

Unit V **[8 Hrs]**

Principal stresses and strains: Definition of principal planes & principal stresses, analytical method of determining stresses on oblique section when member is subjected to direct stress in one plane in mutually perpendicular two planes, when member is subjected to shear stress and direct stresses in two mutually perpendicular planes, Mohr's circle for representation of stresses.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Strength of Materials	R K Bansal	4th Edition	Laxmi Publications
2	Strength of Materials	S. Ramamrtham	20th Edition	Dhanpat Rai and Sons
3	Strength of Material	R. K. Rajput	7th Edition	S. Chand Publications

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Mechanics of Material	Beer and Johnston	8th Edition	Tata McGraw Hill
2	Strength of Materials	U. C. Jindal	2nd Edition	Umesh Publications

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
23CV302P	Solid Mechanics Lab	-	-	2	1	CA	ESE	Total
						25	25	50
Course Objectives		Course Outcomes						
-		At the end of the course, the students will be able to- 1. Perform tension, compression, bending, shear and torsion tests on specimens. 2. Perform impact and hardness tests on specimens. 3. Sketch stress diagrams using Mohr's Circle method. 4. Demonstrate stiffness determination of a helical spring						

Expt. No.	Title of the experiment
1	To perform Tension test for a metal specimen.
2	To perform Hardness test on a metal specimen.
3	To perform Impact test on a metal specimen.
4	To perform Torsion test on a metal specimen.
5	To perform Compression test on Bricks
6	To perform Shear test on a metal specimen
7	To perform Bending test on a wooden specimen
8	To perform a test for calculation of deflection of a beam.
9	To determine stresses using Mohr's Circle method.
10	To demonstrate stiffness determination of a helical spring.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Relevant BIS Codes	-	-	-
2	Virtual Labs	-	-	-

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ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV303T	Construction Materials & Concreting Techniques	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1. Introduce the concept of concrete and various constituents of concrete. 2. Elaborate the IS requirements of various constituents of concrete. 3. Understand the special grades of concrete and various challenges posed in handling concrete. 4. Identify components of a building: sub-structure & super-structure.	At the end of the course, students will be able to: 1. Understand the various tests on cement. 2. Design an appropriate concrete mix with / without admixtures. 3. Understand the various tests on concrete, durability of concrete and identify special concrete. 4. Recognize the various components and processes pertaining to sub-structure construction. 5. Recognize the various components and processes pertaining to super-structure construction.

Unit I **[9 Hrs]**

Cement and Admixtures - Types of Cement, Physical Test on Cement, Lab Test - Consistency Test, Initial and final Setting Time of Cement, Fineness test for Cement, Compressive Strength for Cement. Practical demos of testing. **Mineral Admixture -** Fly Ash, GGBS, Micro silica / Silica Fume, Metakaolin / Rice Husk Ash, Composite Cement and Ultrafine Materials, Lab Test - Fineness of Fly ash.

Unit II **[9 Hrs]**

Water and Chemical Admixture – Source, Requirements, Limits and Testing, Chemical admixture – IS requirements, different types. **Blending of Aggregate** - Blending of Fine and Coarse Aggregate, gradation for optimization and practical aspects. Thumb rules for blending. **Mix design** - Volumetric Mix Design, Mix Design by Absolute Volume Method, worked out practical examples based on Industries experience at Project sites over several decades. Higher grades of concrete.

Unit III **[9 Hrs]**

Test on Concrete - Workability of concrete, Flexural and compressive Strength tests. **Production of Concrete** - Batching Plant, Calibration, Mixing and Transportation of concrete, (Site video). **Handling of concrete at construction** - Placing, Levelling and Compaction. Cold Joints, (Site video), Finishing and Curing and Protection of Concrete (Site video)

Special Types of concrete - Self-Compacting concrete, Mass Concrete, Dry Lean Concrete, Pavement Quality Concrete. (Site video). Issues at Project, Plastic Shrinkage Cracks, Plastic Settlement, Honey comb, Cold Joint, Bug holes, Cover to Concrete, Do's and Don'ts in Concrete Construction. (Site video)

Unit IV **[7 Hrs]**

Substructure - Overview of Building components, Shallow and Deep Foundations, Settlement of Foundation: Types, Causes and Remedial measures. Brick Masonry & Stone Masonry - Plastering and Pointing - Cavity Walls, Damp Proofing, Underpinning.

Unit V **[11 Hrs]**

Superstructure -Building Circulation and Ventilation, Scaffolding and Shoring: Purpose, Types, Process of Erection and Dismantling. Formwork: Definition of Form work, Requirements of Formwork, Materials used in Formwork, Types of Formwork, Removal of formwork. **Roofs -** Flat and pitches roofs, roof coverings, types and their constructional features.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Building Construction & Materials	Sushil Kumar		
2	Concrete Technology	M. S. Shetty	2004	S. Chand & Co.
3	Building Construction	S. P. Arora and Bindra	2013	Dhanpat Rai Publication, Delhi
4	Building construction	S. C. Rangawala	2016	Charotar Publication
5	Building Construction	B. C. Punmia and A.K.Jain	2005	Firewall Media

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Fundamental building materials	Ken Ward-Harvey	2019	Universal
2	Fundamentals of Building Construction; Materials and Methods	Edward Allen, Joseph Iano	2013	Willey Publications
3	Engineering materials,	Rangwala	2015	Charotar Publishers
4	Relevant BIS codes	-	-	-

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
23CV303P	Construction Materials & Concreting Techniques Lab	-	-	2	1	CA	ESE	Total
						25	25	50
Course Objectives		Course Outcomes						
-		At the end of the course, students will be able to- 1. Conduct tests on cement and aggregate. 2. Conduct tests on fresh and hardened concrete. 3. Sketch various components of a building.						

Expt. No.	Title of the experiment
1	Determination of Normal consistency and setting time of cement.
2	Determination of soundness of cement.
3	Determination of compressive strength of cement.
4	Determination of fineness modulus and specific gravity of aggregates
5	Determination of workability of concrete
6	Determination of compressive strength of concrete.
7	Determination of strength by N D T: Rebound hammer test.
8	Identify the components of a building by inspecting the available model and prepare a report.
9	Visit to construction site to observe brickwork. Sill, Lintel, Chajja, Slab, Parapet wall and prepare a report.
10	Draw components of buildings.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Indian Standard Plain And Reinforced Concrete - Code of Practice IS 456 – 2000	BIS	2000	BIS
2	Indian Standard Concrete Mix Proportioning - Guidelines (First Revision) IS 10262 – 2009.	BIS	2009	BIS
3	Other relevant BIS codes	BIS	-	BIS

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV304T	Environmental Engineering	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1. To understand the physical, chemical and bacteriological characteristics of water and waste water. 2. To understand the basic principles and processes of various units involved in water and wastewater treatment.	At the end of the course, the students will be able to- 1. Recognize the necessity of water treatment based on its characteristics. 2. Recognize the units' processes involved in water treatment plants. 3. Understand hydraulic design concepts and conveyance of treated water. 4. Recognize the units' processes involved in primary treatment of wastewater. 5. Understand the units' processes involved in secondary treatment of wastewater and working & maintenance of sewer appurtenances.

Unit I	**[8 Hrs]**
Introduction to water And its Treatment: Importance and necessity of water supply scheme. All types of water demand, empirical formulae, factors affecting per capita demand, variation in demand, design period, population forecasting methods and examples. **Water quality:** Physical, Chemical and bacteriological characteristics of water.	
Unit II	**[8 Hrs]**
Water treatment Objectives, Unit operations and processes in surface water treatment – Principles, functions and preliminary design of flash mixers, clariflocculators, sedimentation tanks, Slow and Rapid sand filters, Aeration, Iron and Manganese removal, Defluoridation and Demineralization – water softening, Disinfection.	
Unit III	**[8 Hrs]**
Conveyance of water: Types of pipes, joints, fittings, valves & appurtenances. **Hydraulic design aspects:** Friction, Manning's, Darcy Weishbach & Hazen Williams equation and problem. Concept of rising main, Classification, working, merits and demerits, selection of pumps. **Water treatment :** Typical layouts and water distribution.	
Unit IV	**[7 Hrs]**
Introduction to Waste Water Treatment: Study of waste water, black water & grey water. Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant, Quantity and flow variation. **Primary treatment :** Principles, functions and preliminary design of screen, grit chambers and primary sedimentation tanks.	
Unit V	**[7 Hrs]**
Secondary Treatment of Waste Water : Activated Sludge Process and Trickling filter; Other treatment methods – Stabilization Ponds and Septic tanks **Sewer Appurtenances :** Manhole street inlets, storm water overflows, inverted syphons, flushing and ventilation, Sewer testing and maintenance.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Theory and Practice of water & wastewater treatment	Droste R.L.	-	John Wiley & sons.
2	Environmental Engineering	S. K. Garg	-	Khanna Publishers
3	Water supply & Sanitary Engineering	Rangwala S. C.	-	Charotar Publishers

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Environmental Engineering	Peavy H.S.,.Rowe D.R and George T	-	McGraw Hill
2	Wastewater Engineering, Treatment and reuse	Metcalf and Eddy	-	Tata McGraw Hill

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV304P	Environmental Engineering Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
-	At the end of the course, the students will be able to- 1. Assess the quality of water. 2. Assess the quality of wastewater. 3. Summarize the treatment processes based on site visit(s).

Expt. No.	Title of the experiment
Part A (Any eight experiments out of the following)	
1	Determination of pH of water
2	Determination of Conductivity of water
3	Determination Chlorides present in water
4	Determination of Alkalinity and Acidityof Water
5	Determination of Turbidity of Water
6	Determination of Dissolved Oxygen of Water
7	Jar Testfor determining the optimum coagulant dose
8	Determination of Available Chlorine and Residual Chlorine in Water
9	Study practical of BOD & COD Test of Waste Water
Part B : Brief Report on Water Treatment and Waste Water Treatment Plant Visit.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Water supply and Sanitory Engineering	Birdie G.S.	-	Dhanpat Rai Publications
2	Water supply & Sanitary Engineering	B. C. Punmia	-	Laxmi Publications
3	Other relevant BIS codes	-	-	-

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23ES301T	Value Education Course-I	2	-	-	2	15	35	50

Course Objectives	Course Outcomes
This course is intended To develop a holistic perspective through self-exploration and development of clarity about harmony between self, family, society and nature.	**Students will be able to** ● Demonstrate awareness about concepts like self-exploration & natural acceptance. ● Understand concepts of aspirations and Happiness. ● Develop clarity of harmony and health in human being. ● Discuss concepts of conservation of nature and harmony in nature/existence and re-usability.

Unit I : Introduction to Self-Exploration	**[6Hrs]**
● Purpose & motivation for studying universal human values. ● Self-Exploration–what is it? - Its content and process. ● 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.	
Unit II: Understanding Happiness and Prosperity	**[6Hrs]**
● Understanding Happiness and Prosperity correctly. ● Continuous Happiness and Prosperity- A look at basic Human Aspirations. ● Right understanding, Relationship and Physical Facility. ● Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	
Unit III: Understanding Harmony in human being	**[6Hrs]**
● Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. ● Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. ● Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). ● Understanding the characteristics and activities of 'I' and harmony in 'I'. ● Understanding the harmony of I with the Body: Sanyam and Health.	
Unit IV: Co-existing with nature	**[6Hrs]**
● Understanding the harmony in Nature. ● Interconnection and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. ● Understanding Existence as Coexistence of mutually interacting units in all-pervasive space. ● Holistic perception of harmony at all levels of existence. ● Pollution, depletion of resources and role of technology.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Human Values and Professional Ethics	Gaur, Sangal, Bagaria	2010	Excel Books, New Delhi

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Jeevan Vidya: Ek Parichaya	A. Nagaraj	1999	Jeevan Vidya Prakashan, Amarkantak
2	Human Values	A.N. Tripathi	2004	New Age Intl. Publishers, New Delhi
3	The Story of My Experiments with Truth	M.K.Gandhi	2009	Fingerprint! Publishers

Online Resources

1	https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php
2	https://fdp-si.aicte-india.org/UHV-II_Lectures_PPTs.php

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV331M	MDM-I Basics of Civil Engineering	2	-	-	2	15	35	50

Course Objectives	Course Outcomes
It focuses on the recognition of knowledge and skills required for the planning, coordination and successful implementation of Civil Engineering Projects.	At the end of the course, students will be able to- 1. Recognize the role of Civil Engineering profession in the development of society and importance of water resources engineering. 2. Understand surveying, mapping and related instrumentation. 3. Explain instruments used in the various streams of Civil Engineering.

Unit I **[7 Hrs]**

Introduction to Civil Engineering Introduction and scope of Civil Engineering. Role of Engineers in the infrastructure development.

Water Resources Engineering Introduction to Hydraulic structures of storage; water conveyance systems; Watershed management: Definition, Necessity and methods; Roof top rain water harvesting and Ground water recharge: relevance and methods.

Unit II **[7 Hrs]**

Basics of Surveying Various types of maps and their uses; Introduction to digital mapping; Principles of survey. Introduction to various survey instruments such as EDM, Lasers, Total Station, and digital planimeter, Modern Surveying Techniques.

Unit III **[7 Hrs]**

Instrumentation in Civil Engineering Structures: Various Instruments used in construction, water resources, Environmental Engineering, Foundation Engineering, Thermocouples, condition monitoring equipment, Half Cell Potentiometers, Strain Gauges. Management of Utilities using telemetry & SCADA System.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Elements of civil engineering	S S Bhavikatti	8 January 2015	Swathi-N-R
2	Basic Civil Engineering	B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain	First Edition	Laxmi Publications

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Construction Planning, Equipment and methods	Peurifoy	-	Tata McGraw Hill Publication
2	Construction Technology	Sankar S.K. and Saraswati S.	-	Oxford University Press, New Delhi
3	Building Construction	Sushil Kumar	19th	Standard Publisher Distributors, New Delhi
4	Elements of Civil Engineering	S. S. Bhavikatti	-	Vikas Publishing House Pvt Limited

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