

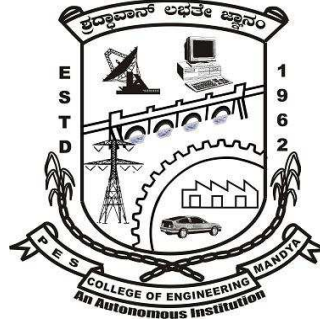
# SYLLABUS FOR B.E. III & IV SEMESTER

(With effect from 2017 - 18 Academic year)

## ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2017-18)

**BACHELOR DEGREE  
IN  
CIVIL ENGINEERING  
OUT COME BASED EDUCATION  
WITH  
CHOICE BASED CREDIT SYSTEM**



**P.E.S. COLLEGE OF ENGINEERING,**

**MANDYA - 571 401, KARNATAKA**

*(An Autonomous Institution Affiliated to VTU, Belagavi)*

*Grant -in- Aid Institution (Government of Karnataka)*

*Accredited by NBA, New Delhi & Approved by AICTE, New Delhi.*

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

ಮಂಡ್ಯ-571 401, ಕರ್ನಾಟಕ

(ವಿ.ಟಿ.ಯು, ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

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## **PREFACE**

PES College of Engineering, Mandya, started in the year 1962, has become autonomous institute in the academic year 2008-09. Since, then it has been doing the academics and assessment activities successfully. The college is running eight undergraduate and eight Postgraduate programs including MBA and MCA which are affiliated to VTU, Belagavi.

India has recently become a Permanent Member of the Washington Accord. The accord was signed by the National Board of Accreditation (NBA) on behalf of India on 13<sup>th</sup> June 2014. It enables not only the mobility of our degree globally but also establishes equivalence to our degrees with that of the member nations. The implementation of Outcome Based Education (OBE) has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the various countries.

*Our Higher Educational Institution has adopted the Choice Based Credit System (CBCS) based semester structure with OBE scheme and grading system. Which provides the flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. There lies a shift in thinking, teaching and learning process moving towards Students Centric from Teachers Centric education which enhances the knowledge, skills & moral values of each student.*

Choice Based Credit System (CBCS) provides the options for the students to select from the number of prescribed courses. The CBCS provides a ‘cafeteria’ type approach in which the students can Choose electives from a wide range of courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, adopt an interdisciplinary approach for learning which enables integration of concepts, theories, techniques. These are greatly enhances the skill/employability of students.

In order to increase the Industry/Corporate readiness, many Soft Skills, self learning components and Personality Development modules have been added to the existing curriculum. In order to enhance creativity and innovation Mini Project and Industrial visit & Interaction are made mandatory for all undergraduate programs.

**Dr. Umesh D R**  
Deputy Dean (Academic)  
Associate Professor,  
Dept. of Computer Science & Engg.

**Dr. P S Puttaswamy**  
Dean (Academic)  
Professor,  
Dept. of Electrical & Electronics Engg.

**PES College of Engineering**

**VISION**

“PESCE shall be a leading institution imparting quality Engineering and Management education developing creative and socially responsible professionals.”

**MISSION**

- Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.
- Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.
- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.
- Promote research, product development and industry-institution interaction.

**Department of Civil Engineering**

The Civil Engineering Department was started in the year 1962 as one of the first branches in P.E.S. College of Engineering, Mandya with an intake of 40. The department has carved a niche for itself by offering the most competent instructional programs to the students. The department is running an undergraduate programme with an intake of 120 and it has started PG in CAD Structures with an intake of 18 in the year 2006. The department has been recognized as research centre under VTU, Belgaum. The department is accredited by NBA, New Delhi for five years (2004-2009). The department is well equipped with laboratories, computing facilities, independent library and other infrastructure. The department has well qualified and experienced teaching faculties. The department also takes up consultancy work pertaining to planning, structural designs of buildings, testing of materials, soil investigation.

**VISION**

“To attain Excellence in imparting quality civil engineering education to meet the societal needs.”

**MISSION**

- Impart civil engineering and managerial skills with state of art infrastructure, competent and committed faculty using outcome based educational curriculum.
- Promote research, project management and consultancy
- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

- Apply technical competence in the field of Civil Engineering with a strong background in basic science and mathematics.
- Analyse and interpret data to design or evaluate civil engineering systems to satisfy societal needs with the use of modern tools including higher education.
- Function effectively as an individual and or to work in a team on multispecialized civil engineering projects with professional ethics and effective communication skills inculcating the habit of life-long learning.

**PROGRAMME OUTCOMES (POs):**

The BACHELOR OF ENGINEERING Programme in Civil Engineering [B.E. (CE)] must demonstrate that its graduates have

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. 65 Department of Civil Engineering, P.E.S.C.E, Mandya
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Department of Civil Engineering**

III Semester B.E. (Civil)			Scheme of Teaching And Examination					
Sl No	Course Code	Course Title	Teaching Dept.	Hrs/Week L:T:P:H	Credit	Examination Marks		
						CIE	SEE	Total Marks
1.	P17MAT31	Course I - Engineering Mathematics-III	Maths	3:2:0:5	4	50	50	100
2.	P17CV32	Building Materials & Construction	Civil	4:0:0:4	4	50	50	100
3.	P17CV33	Strength of Materials	Civil	4:0:0:4	4	50	50	100
4.	P17CV34	Basic Surveying	Civil	4:0:0:4	4	50	50	100
5.	P17CV35	Fluid Mechanics	Civil	4:0:0:4	4	50	50	100
6.	P17CV36	Applied Engineering Geology	Civil	3:0:0:3	3	50	50	100
7.	P17CVL37	Basic Surveying Practice	Civil	0:0:3:3	1.5	50	50	100
8.	P17CVL38	Basic Material testing lab	Civil	0:0:3:3	1.5	50	50	100
9.	P17HUDIP39	Comprehensive communication development(CCD)	HS&M	2:0:0:2	[2]	[50]	[50]	[100]
10.	P17HU39	Aptitude and reasoning development - Beginner(ARDB)	HS&M	2:0:0:2	0	(50)	--	--
11.	P17HMDIP310	Indian Constitution , Human rights & Professional Ethics	Human & Science	2:0:0:2	0	--	---	---
12.	P17MADIP31	*Additional Maths-I	Maths	4:0:0:4	0	--	---	---
Total					26 [28]	400 [450]	400 [450]	800 [900]

L: Lecture, T: Tutorial, P: Practical, H: Hrs/ Week, CIE: Continuous internal evaluation, SEE semester end Examination, C: Credits. \* **Additional Mathematics-I & Constitution of India and Professional Ethics : Lateral entry students shall have to pass these mandatory learning courses before completion of VI- Semester**  
**\*\* ARDB: All students shall have to pass this mandatory learning courses before completion of VI- Semester**

IV Semester B.E. (Civil)			Scheme of Teaching And Examination					
Sl No.	Course Code	Course Title	Teaching Dept.	Hrs/Week L:T:P:H	Credit	Examination Marks		
						CIE	SEE	Total Marks
1.	P17MAAC41 <sup>+</sup> / P17MAES41 <sup>++</sup>	Course I - Engineering Mathematics-IV(HC)	Maths	3:2:0:5	4	50	50	100
2.	P17CV42	Concrete Technology	Civil	4:0:0:4	4	50	50	100
3.	P17CV43	Basic Structural Analysis	Civil	4:0:0:4	4	50	50	100
4.	P17CV44	Applied Surveying	Civil	4:0:0:4	4	50	50	100
5.	P17CV45	Hydraulics & Hydraulic Machines	Civil	4:0:0:4	4	50	50	100
6.	P17CV46	Highway Engineering	Civil	3:0:0:3	3	50	50	100
7.	P17CVL47	Applied Surveying practice	Civil	0:0:3:3	1.5	50	50	100
8.	P17CVL48	Hydraulics & Hydraulics Machines lab	Civil	0:0:3:3	1.5	50	50	100
9	P17HU49	Aptitude and reasoning development – Intermediate (ARDI)	HS&M	2:0:0:2	1	50	50	100
10	P17EVDIP410	*Environmental Studies	Civil	2:0:0:2	0	--	--	--
11	P17MADIP41	*Additional Maths-II	Maths	4:0:0:4	0	--	--	--
Total					27	450	450	900
<b>* Additional Mathematics-II &amp; Environmental Studies: Lateral entry students shall have to pass these mandatory learning courses before completion of VI- Semester</b>								
<sup>+</sup> Common to BE (AU, CV, ME and I&PE)			<sup>++</sup> Common to BE (CS, EC, E&E and IS&E)					

<b>Course Title: Engineering Mathematics-III(Common to All Branches)</b>			
<b>Course Code: P17MA31</b>	<b>Semester: III</b>	<b>L – T – P – H : 3– 2 – 0 – 5</b>	<b>Credits:4</b>
<b>Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %; SEE: 50%</b>	

**Prerequisites:** The student should have acquired the knowledge of Engineering Mathematics-I & II of I and II semester B.E.

**Course Learning Objectives (CLOs):**

**The course P17MA31 aims to:**

1. Describe the concepts of elementary numerical analysis such as forward/backward finite differences, central differences, interpolation and extrapolation formulae, techniques of numerical differentiation and integration.
2. Explain the nature of periodic functions Fourier series of general as well as even /odd functions valid in full range/half-range periods along with applications through practical harmonic analysis.
3. Learn modeling in terms of partial differential equations and also, learn different exact/analytical methods of solving with special emphasis on interpretation of the solution of one-dimensional wave, heat and Laplace equations with given initial and boundary conditions in the context of various engineering and technological applications.

**Relevance of the course:**

- Engineering Mathematics-III deals with the Numerical methods to solve interpolation and extrapolation problems in engineering field.
- In Fourier series analyze engineering problems arising in control theory and fluid flow phenomena using harmonic analysis
- Analyze the engineering problems arising in signals and systems, digital signal processing using Fourier transform techniques.
- Z-transforms & Z-transforms of standard functions to solve the specific problems by using properties of Z-transforms.
- Identify and solve difference equations arising in engineering applications using inverse Z-transforms techniques
- Partial Differential Equations (PDE's), order, degree and formation of PDE's and, to solve PDE's by various methods of solution.
- One – dimensional wave and heat equation and Laplace's equation and physical significance of their solutions to the problems selected from engineering field

**Course Content**

**UNIT-I**

**Numerical Methods-I: Finite differences:** Forward and Backward differences, Gregory-Newton forward and backward interpolation formulae, Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula. (All formulae without proof) – Problems only  
Central differences: Gauss Forward and Backward difference formulae, Sterling's, and Bessel's formulae (All formulae without proof) – problems.

**Self-Study Component:** Problems using Everett's formula in Central differences **10 Hrs**

### UNIT-II

**Numerical differentiation** using Newton's forward and backward interpolation formulae, Newton's divided difference formula and Sterling's formula (All formulae without proof)- problems only and Applications to Maxima and Minima of a tabulated function.

**Numerical integration:** Newton- Cotes quadrature formula, Trapezoidal rule, Simpson's ( $\frac{1}{3}$ )<sup>rd</sup> rule, Simpson's ( $\frac{3}{8}$ )<sup>th</sup> rule, Boole's rule and Weddle's rule (All rules without proof)- Illustrative problems.

**Self-Study Component:** Derive Newton- Cotes quadrature formula. **10 Hrs**

### UNIT-III

**Fourier series:** Periodic functions, Fourier series- Euler's formula, Dirichlet's conditions. Fourier series of discontinuous functions, Fourier series of even and odd functions. Change of interval- Fourier series of functions of arbitrary period. Half-range Fourier series expansions, Fourier series in complex form, Practical harmonic analysis- Illustrative examples from engineering field.

**Self-Study Component:** Derivations of Euler's formulae **11 Hrs**

### UNIT-IV

**Fourier Transforms:** Infinite Fourier transforms-properties. Fourier sine and Fourier cosine transforms, properties. Inverse infinite Fourier and inverse Fourier sine & cosine transforms – Illustrative examples.

**Difference equations and Z-transforms:** Definition of Z-transforms- standard Z-transforms, linearity property, damping rule, shifting rules, initial value theorem and final value theorem (All rules and theorems without proof). Inverse Z – transforms. Difference equations- basic definitions. Application of Z-transforms to solve difference equations.

**Self-Study Component:** Convolution theorem, Parseval's identities.related problems. **10 Hrs**

### UNIT-V

Partial differential equations (PDE's):

Formation of PDE's. Solution of non-homogeneous PDE by direct integration. Solutions of homogeneous PDE involving derivative with respect to one independent variable only (both types with given set of conditions). Method of separation of variables (first and second order equations). Solution of the Lagrange's linear PDE's of the type:  $Pp + Qq = R$ .

Applications of PDE's:

One- dimensional wave and heat equations (No derivation), and various possible solutions of these by the method of separation of variables. D'Alembert's solution of wave equation. Two dimensional

Laplace's equation (No derivation)-various possible solutions. Solution of all these equations with specified boundary conditions (Boundary value problems). Illustrative examples from engineering field.

**Self-Study Component:** Finding the solution of non-linear equations of first order: Charpit's Method -simple problem. **11 Hrs**

**Text Books:**

1. Higher Engineering Mathematics: B.S. Grewal, Khanna Publishers, New Delhi, 42nd Ed. 2012.
2. Advanced Engineering Mathematics: - E. Kreyszig, John Wiley & Sons, 6<sup>th</sup> Ed.2007.

**References:**

1. Advanced Modern Engineering Mathematics: - Glyn James, Pearson Education Ltd., 3<sup>rd</sup> Ed., 2007.
2. Advanced Engineering Mathematics: Peter V O' Neil Thomson, Brooks/Cole, 5th edition, 2007.
3. Higher Engineering Mathematics: - B.V. RAMANA, McGraw Hill Education, 2007

**Note:** - Each unit contains *two* full questions of *20 marks* each. Students are required to answer *five* full questions choosing at least *one* question from each unit.

**Note:** Self study is for 5 marks only in CIE and not in SEE

**Course Outcomes**

After learning all the units of the course, the student is able to;

1. Apply forward, backward difference formulae and central differences formulae in solving interpolation- extrapolation problems in engineering field.
2. Apply Numerical differentiation and integration rules in solving engineering where the handling of numerical methods is inevitable.
3. Recognize the importance of Fourier series & Fourier transforms, difference equations and Z-transforms in the field of signals and systems, communication and network theory signal and image processing, control theory, flow & heat transfer and theory of elasticity.
4. Learn modeling in terms of partial differential equations and also, learn different exact/analytical methods of solving with special emphasis on interpretation of the solution.
5. Interpret the solution of one-dimensional wave, heat and Laplace equations with given initial and boundary conditions in the context of various engineering and technological applications.

**Course Articulation Matrix (CAM)**

<b>Title : Engineering Mathematics –III</b>												
<b>CO's</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO-1	1	2	-	-	-	-	-	-	-	-	-	-
CO-2	2	2	-	-	-	-	-	-	-	-	-	-
CO-3	3	3	-	-	-	-	-	-	-	-	-	-
CO-4	2	3	-	-	-	-	-	-	-	-	-	-
CO-5	2	3	-	-	-	-	-	-	-	-	-	-



<b>Course Title : BUILDING MATERIALS &amp; CONSTRUCTION</b>			
<b>Course Code: P17CV32</b>	<b>Semester: III</b>	<b>L – T – P – H : 4– 0 – 0 – 4</b>	<b>Credits:4</b>
<b>Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %;</b>	<b>SEE: 50%</b>

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Define building stones, bricks, tiles, timbers, cement & Steel.
2. Explain different types of construction materials.
3. Classify bonds in brick work, scaffolding, shoring, underpinning and types of flooring.
4. Explain different types of roofs, stairs, doors, windows and ventilators.
5. Explain purpose of plastering and methods of plastering and painting.

**Course Content**

**UNIT-I**

**Building Materials:** Qualities of good building stones, dressing of stones, classifications of bricks, manufacture of bricks, qualities of good bricks, types of tiles, qualities of good tiles & its uses. Classifications of timber as per Indian standards. Defects in timber, seasoning of timber, plywood and its uses.

**Self study component:** The students shall visit construction sites and learn to identify different types of building stones, bricks, stabilized mud blocks, concrete blocks. They shall visit timber depot and learn to identify different types of wood. **10 Hrs**

**UNIT-II**

**Foundation:** Preliminary investigation of soil, bearing capacity of soil, safe bearing capacity of soil, methods of determining bearing capacity, methods of improving bearing capacity. classification of foundations, introduction to different types of foundations, masonry footings - basic numerical problems, isolated footings, combined and strap RCC footings, raft footing, foundation in black cotton soil (or expansive soil) .

**Self study component:** The students shall visit construction sites and learn to identify different types of foundations and details of super structures. **10 Hrs**

**UNIT-III**

**Masonry arches and floors:** Definition of terms used in masonry, bonds in brickwork, English bond, Flemish bond, reinforced brickwork, stone masonry, rubble masonry, coursed rubble masonry.

**Arches:** masonry arches, classification, stability of an arch, lintels, types and classifications, shoring, underpinning, scaffolding.

**Floors:** Types of flooring (materials and method of laying), mosaic, marble, polished granite, industrial flooring, flat roof (R.C.C.) **10Hrs**

**Self study component:** Factors affecting selection of flooring materials,

**UNIT – IV**

**Roofs, stairs, doors and windows:** Sloped roof (R.C.C. and tile roof), lean to roof, wooden truss (King post and Queen post trusses) steel trusses.

**Stairs:** technical terms in stairs, requirements of a good stair, geometric design of RCC dog legged and open well stairs. (Plan and sectional elevation of stairs),

**Doors and windows:** Doors, paneled doors, flush doors, collapsible and rolling shutters, Types of windows- paneled, glazed, bay window, dormer window, louvered and corner window, ventilators

**Self study component:** Fixtures and fastenings **12 Hrs**

**UNIT- V**

**Plastering and painting:** Purpose of plastering, materials of plastering, lime mortar, cement mortar, methods of plastering, stucco plastering, Purpose of painting, types of paints, application of paints to new surfaces, distemper, plastic emulsion, enamel, painting on iron and steel surfaces. Polishing of wood surface.

**Introduction to cost effective construction, miscellaneous topics:** Necessity, advantages, prefabrication techniques, pre-cast doors and windows (pre-cast frames and shutters)

**Miscellaneous topics:** Form work, form work details, RCC columns, beams floors.

**Self study component:** slip forming and damp proof construction. **10Hrs**

**Text Book:**

1. B.C. Punmia, "Building Construction", 10th Edition, Laxmi Publications, New Delhi, 2007.
2. S.C Rangwala., "Engineering Materials", 28th Edition, Charotar Publishing House, Anand, 1997

**Reference Books:**

1. P.C. Varghese. "Building Construction", Prentice Hall of India, New Delhi, 2007
2. W B Mackay, "Building Construction" Vol 4, Pearson Publications.
3. Chudley "Construction Technology", 4th Edition. Pearson Publications.
4. Barry, "Construction of Buildings", 7th Edition, Wiley-black well Publications.
5. National Building Code, BIS, New Delhi.

**Note: Self study is for 5 marks only in CIE and not in SEE**

**Course Outcomes**

**After learning all the units of the course, the student is able to**

1. Understand the properties and use of construction materials (PO1,PO2, PS01)
2. To identify types of footing, RCC, raft foundations in different soils (P01, PO2,PS02)
3. To classify Bonds in brick work, English bond, Flemish bond, Joints in stone masonry, arches. (PO1, P02, PS02, PS01)
4. To understand the building components and method of construction ( P01, P02, PS01,PS02)

**Course Articulation Matrix (CAM)**

Sl No.	Course Outcome-CO's	Program outcome												Program Specific outcome			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	Understand the properties and use of construction materials.	2	3												2		
2	To identify types of footing, RCC, raft foundations in different soils.	2	2												1	2	
3	To classify Bonds in brick work, English bond, Flemish bond, Joints in stone masonry, arches.	2	3												1	2	
4	To understand the building components and method of construction.	2	3												1	2	

<b>Course Title : STRENGTH OF MATERIALS</b>			
<b>Course Code: P17CV33</b>	<b>Semester: III</b>	<b>L – T – P – H : 4– 0 – 0 – 4</b>	<b>Credits:4</b>
<b>Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %;</b>	<b>SEE: 50%</b>

**Prerequisites:** Engineering Mechanics

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Understand the concept of deformable bodies and elastic properties of engineering materials
2. Explain the concept of compound stresses, on inclined planes, general two dimensional stress system, principal planes and stresses and construct and interpret Mohr's circle for stresses for various cases of two dimensional stress systems.
3. Apply the concept of BM, SF and relation between loading, shear force and bending moment, BMD, SFD with salient values for cantilever beams, simply supported beams and overhanging beams subjected to gravity loads and their combinations and couple.
4. Determine the concept of simple bending theory, neutral axis, modulus of rupture, section modulus, flexural rigidity and stresses due to bending of beams of uniform section problems, distribution of shear stress in beam of rectangular, symmetrical I section, T section and circular section and problems
5. Analyse the concept of pure torsion and elastic stability of columns.

**Relevance of course** : To understand behavior of materials is a must in civil engineering.

**Course Content**

**UNIT – I**

**Simple stress and strain:** Introduction to simple stresses and strains- direct stresses and shear stresses, linear strain, Hook's law, and Poisson's ratio, stress - strain curve for ductile and brittle materials- elastic limit, yield point, ultimate strength, working stress and factor of safety. Elongation of uniform bar, tapering bars of circular and rectangular cross sections subjected to external loads. Elongation of uniform bar and tapering bar due to self weight. Compound bars subjected to external loads. Principle of super position. Elastic constants and relationship between them. Expression for volumetric strain. Thermal stresses in uniform bars and compound bars. Numericals.

**Self Study:** Stress – strain curve for High Yield strength Bars including salient features.

**10 Hrs**

**UNIT -II**

**Compound stresses:** Introduction, general two dimensional stress system, principal planes and principal stresses. Normal stress and tangential stress on an inclined plane in a general 2-D stress system. Equations for principal planes and principal stresses. Equation for planes of maximum shear stress and the value of maximum shear stress in 2-D stress system. Mohr's circle of stresses. Numericals.

**Thick and thin cylinders:** Introduction to thin and thick cylinders. Equation for longitudinal stress and circumferential stress in thin cylinders subjected to internal pressure. Efficiencies of joints in thin cylinders. Equation for Longitudinal strain, circumferential strain and volumetric strain in thin cylinders subjected to internal pressure. Variation of stresses in case of thick cylinders. Equation for radial stress and hoop stress in case of thick cylinders (Lame's

Equations). Numericals.

**Self Study:** Thin cylinders with hemispherical ends.

**10 Hrs**

### UNIT-III

**Bending moment and shear force in beams:** Introduction to statically determinate beams, types of beams and types of loads. Shear force, bending moment, SFD, and BMD with sign conventions. Sagging BM and Hogging BM. Relationship between shear force, bending moment and intensity of loading. Procedure for the computation of shear force and bending moment. Procedure of drawing SFD and BMD with sign convention. Point of contraflexure. Numericals on SFD, BMD and Point of contraflexure for cantilevers, simply supported beams and overhanging beams subjected to gravity loads and couple.

**Self Study:** SFD and BMD for beams with intermediate hinges.

**10 Hrs**

### UNIT – IV

**Stresses in Beams:** Introduction to bending stresses in beams, simple bending theory, assumptions in simple bending theory, pure bending, Neutral axis, derivation of Bending equation, moment of resistance and section modulus. Numericals on beams of uniform cross sections. Shear stresses in beams, distribution of shear stress in beam of rectangular, circular section, symmetrical I section and T section. Numericals.

**Self Study:** Beams of Uniform strength

**12Hrs**

### UNIT-V

**Elastic stability of columns:** Introduction, short and long columns, failure of short and long columns, effective length, slenderness ratio, radius of gyration and buckling load or crippling load, derivation of equations for Euler's buckling load for different end conditions (Both ends hinged, one end fixed and the other end free, Both ends fixed and One end fixed and the other is hinged), limitations of Euler's theory and Numericals. Rankine's theory and Numericals on Rankine's Theory.

**Torsion of prismatic circular shafts:** Introduction- pure torsion, torsion equation of circular shafts, strength and stiffness equations, torsional rigidity and polar modulus for solid and hollow circular shafts, power transmitted by solid and hollow circular shaft and problems.

**Self Study:** Composite shafts

**10 Hrs**

#### Text Book:

1. Strength of Materials: R Subramanian, Oxford University Press, Edition 2005
2. Mechanics of Materials: B.C Punmia, Ashok Jain, Arun Jain, Lakshmi Publications, New Delhi.
3. Strength of Materials: B S Basavarajiah and P Mahadevappa, CBS Publishers, New Delhi.

#### Reference Books:

1. Strength of Materials: Singer Harper and Row Publications.
2. Mechanics of Materials: Gere and Timoshenko

**Note: Self study is for 5 marks only in CIE and not in SEE**

**COURSE OUTCOMES:**

**After learning all the units of the course, the student is able to**

1. Apply the knowledge of basic science and mathematics to understand the concepts of stress at a point, strain at a point, and the stress-strain relationships for linear, elastic, homogeneous, isotropic materials. (PO1)
2. Analyse structural members subjected to tension, compression, torsion, bending, combined stresses and internal pressure using the fundamental concepts of stress, strain and elastic behavior of materials. (PO2)
3. Compute the stresses and strains in members subjected to tension, compression, torsion, bending, combined stresses and internal pressure. (PO3)
4. Apply the knowledge of strength of materials in future to work effectively either as an individual or as a team member to satisfy the changing professional and societal needs. (PO5, PO9, PO11)

**Course Articulation Matrix(CAM)**

Course Outcome- CO's	Program outcome												Program Specific outcome		
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
<b>CO -1</b>	<b>3</b>												<b>3</b>	<b>1</b>	
<b>CO -2</b>		<b>3</b>											<b>3</b>	<b>2</b>	
<b>CO -3</b>			<b>3</b>										<b>2</b>	<b>3</b>	
<b>CO -4</b>					<b>3</b>				<b>2</b>		<b>1</b>		<b>1</b>	<b>2</b>	<b>3</b>

<b>Course Title : BASIC SURVEYING</b>			
<b>Course Code: P17CV34</b>	<b>Semester: III</b>	<b>L – T – P – H : 4 – 0 – 0 – 4</b>	<b>Credits:4</b>
<b>Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %;</b>	<b>SEE: 50%</b>

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Define surveying. Classify and identify basic principles of surveying.
2. Describe chain surveying and its operations.
3. Determine bearings and internal angles using compass.
4. Distinguish between types of leveling and to prepare data of leveling.
5. Understand characteristics of contours and methods of plane table surveying.
6. Understand the features of theodolite and calculating area and volume.

**Relevance of course** : Features of ground and its elevation w.r.t mean sea level in part of civil engineering

**Course Content**

**UNIT – I**

**Introduction:** Definition of surveying, classification of surveys, basic principles of surveying, uses of surveying units of measurements, errors, classification, precision and accuracy. Map and classification, survey of India topographical maps and their numbering.

**Chain Surveying;** Chain and types, tape and types, ranging of lines, direct and indirect accessories required, selection of stations and lines, offsets and types setting out of right angles, use of optical square, prism square, cross staff, linear methods of setting out right angles, , obstacles in chain survey. Measurement of distances over sloping grounds, chain and tape corrections - numerical problems.

**Self study component:** Booking of chain survey work, field book entries, and conventional symbols. Errors in chain survey and precautions to be taken. **10 Hrs**

**UNIT-II**

**Compass Surveying:** Meridians and bearings, principle, working and use of prismatic compass, Surveyor's compass, magnetic bearing, true bearings, whole circle bearing and reduced bearing, Calculation of bearings, interior angles, dip and declination, local attraction-numerical problems.

**Traverse Survey:** Closed and open traverse, checks for closed traverse and concept of latitude and departure, determination of closing error and its direction, omitted measurements.

**Self study component:** Bowditch's rule and transit rule, Bowditch's graphical method of adjustment of closed traverse. **10 Hrs**

**UNIT-III**

**Introduction to Levelling :** Principles and basic definitions, fundamental axes and relationship and parts of a dumpy level, types of adjustments and objectives, temporary adjustments of a dumpy level, curvature and refraction correction, types of leveling-simple levelling, reciprocal levelling, profile levelling, cross sectioning, fly levelling.

**Reduction of Levelling:** Booking of levels, rise and fall method and height of instrument method, comparison, arithmetic checks, fly back levelling, Numerical problems.

**Self study component:** Sensitiveness of bubble tube, Errors and precautions of levelling.

**10 Hrs**

**UNIT-IV**

**Contouring:** Contours and their characteristics, methods of contouring, direct and indirect methods, interpolation techniques, uses of contours, and numerical problems on determining inter visibility, grade contours and uses.

**Plane table survey:** Plane table and accessories, advantages and limitations of plane table survey, orientation and methods of orientation, methods of plotting, radiation, intersection, traversing, resection method.

**Self study component:** EDM Devices, planimeter, digital planimeter, hand level, Ceylon ghat tracer, Abney level, Sextant. **12Hrs**

**UNIT – V**

**Theodolite Survey :** Theodolite and types, fundamental axes and relationship, parts of a transit theodolite, uses of theodolite, temporary adjustments of a transit theodolite, measurement of horizontal angles, method of repetitions and reiterations, measurements of vertical angles,

**Area and Volume Measurement:** Measurement of area- by dividing the area into geometrical figures, area from offsets, mid ordinates, mid ordinate rule, trapezoidal and Simpsons one third rule, area from co-ordinates.

**Self study component:** Prolonging a straight line by a theodolite in adjustment and theodolite

not in adjustment, Measurement of volume-trapezoidal and prismoidal formula.

**10 Hrs**

**Text Book:**

1. Surveying, Vol-1 - B.C. Punmia , Laxmi Publications, New Delhi.
2. Plane Surveying, Vol-1-A.M. Chandra, Newage International ® Ltd.

**Reference Books:**

1. Plane Surveying, ALAK, S. Chand and Company Ltd., New Delhi.
2. Fundamentals of Surveying - Milton O. Schmidt - Wong, Thomson Learning.
3. Fundamentals of Surveying - S.K. Roy - Prentice Hall of India.
4. Surveying Vol. I, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi. \*  
Survey of India Publication on maps

**Note: Self study is for 5 marks only in CIE and not in SEE**

**Course Outcomes**

**Students will be able to**

1. Apply the knowledge of basic surveying and mathematics for measurements of distance and angles using conventional surveying equipments (PO1, PO12)
2. Conduct traversing to plot the area and locate the objects on the drawing using chain, tape, compass and plane table(PO2,PO12)
3. Prepare the contour plans to estimate area and volume (PO3,PO12)
4. Interpretation of the data of leveling, theodolite surveying to measure the elevation and distances (PO4,PO12)

**Course Articulation Matrix (CAM)**

Sl. No	Course Outcome-CO's	Program outcome												Program Specific outcome				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3		
1	Apply the knowledge of basic surveying and mathematics for measurements of distance and angles using conventional surveying equipments	2														1	1	
2	Conduct traversing to plot the area and locate the objects on the drawing using chain, tape, compass and plane table		2													2		2
3	Prepare the contour plans to estimate area and volume				3											1		2
4	Interpretation of the data of leveling, theodolite surveying to measure the elevation and distances					3											2	2

1-Low, 2-Moderate, 3-High

<b>Course Title : FLUID MECHANICS</b>			
<b>Course Code: P17CV35</b>	<b>Semester: III</b>	<b>L – T – P – H : 4– 0 – 0 – 4</b>	<b>Credits:4</b>
<b>Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %; SEE: 50%</b>	

**Prerequisites :** Physics and Mechanics

### Course Learning Objectives (CLOs)

**This course aims to**

1. Define the concept of fluid, its relevance in civil engineering and classify fluids based on physical properties.
2. Understand hydrostatic pressure and its measurement.
3. Differentiate between kinematic fluid and dynamic fluid flow.
4. Understand flow through pipes and losses due to flow through pipes.
5. Demonstrate flow measurement

**Relevance of course:** Properties of fluids is required in storing of water and its usage

### Course Content

#### UNIT – I

**Introduction:** Scope and importance of subject, its relevance in civil engineering, definition of fluid, distinction between solids and fluid, distinction between liquid and gas, fluid continuum, classification of fluids - Newtonian and Non-Newtonian fluids, ideal and real fluids.

**Fluid properties** Mass density, specific volume, specific weight, relative density, viscosity, Newton's law of viscosity (with units and dimensions) and problems, compressibility, vapour pressure, surface tension, equation for stability of bubble and droplet of liquid, capillarity theory and problems.

**Self study component:** Rheology of fluids.

**10Hrs**

#### UNIT-II

**Fluid pressure and its measurement:** Definition of pressure, units and dimensions, pressure at a point, Pascal's law, hydrostatic pressure law, atmospheric pressure, gauge pressure and absolute pressure. Measurement of pressure, simple manometer theory and problems, differential manometer theory and problems.

**Hydrostatics:** Definition of total pressure, center of pressure, centroid, centroidal depth, depth of center of pressure, equation for hydrostatic force and depth of center of pressure on plane surfaces (horizontal, vertical and inclined) and problems, hydrostatic force on submerged curved surfaces and problems, pressure diagram, problems.

**Self study component:** Mechanical pressure gauges.

**10 Hrs**

#### UNIT-III

**Kinematics of fluids:** Description of fluid flow, Lagrangian and Eulerian approaches, classification of flow, definition of path line, streamline, streak line, stream tube, continuity equation, derivation of continuity equation in differential form, problem on continuity equation, definition of velocity potential, stream function, equipotential line, velocity potential and stream function, relation between velocity potential and stream function.



**Dynamics of fluid flow:** Concept of inertia force and other forces causing motion, derivation of Euler's equation and Bernoulli's equation with assumptions and limitations, kinetic energy correction factor. Modification of Bernoulli's equation, problem on Bernoulli's equation with and without losses, momentum equation, application of Bernoulli's equation - venturimeter and pitot tube, momentum equation, problems

**Self study component:** Flownets.

**12Hrs**

#### **UNIT – IV**

**Flow Through pipes:** Flow through pipes, Reynolds number, definition of hydraulic gradient, energy gradient, major and minor losses in pipe flow, equation for head loss due to friction (Darcy-Weisbach equation), minor losses (types and equations) - problem on minor and major losses. Pipes in series, pipes in parallel and equivalent pipe- problems. Water hammer - equation for rise in pressure due to sudden and gradual closure of valve (no derivation) and problems.

**Self study component:** Pipe Network

**10 Hrs**

#### **UNIT-V**

**Flow Measurement:** Flow through orifices, classification, vena- contracta and discharge through an orifice. Hydraulic co-efficient of an orifice and relation between them, equation for co-efficient of velocity, problems on hydraulic coefficients. Submerged and large rectangular orifices. Flow through mouth pieces, classification, and equation for discharge and pressure head for an external cylindrical mouth piece. Flow over notches, Nappe - Types of Nappe classification and equation for discharge over rectangular, triangular and trapezoidal and, Cipolletti notches- problems. Broad crested weir- problems, submerged weirs, equation for discharge, problems, and ventilation of weirs.

**Self study component:** Proportional weirs.

**10 Hrs**

**Text Book:**

1. Hydraulics and Fluid Mechanics by P.N. Modi and S.M. Seth, Standard Book House, New Delhi.
2. Fluid Mechanics and Hydraulic Machines by Dr. R.K. Bansal, Lakshmi Publications, New Delhi.

**Reference Books:**

1. Fluid Mechanics, by Jain, A.K., Khanna Publishers, New Delhi.
2. Fluid Mechanics and Machinery by Ramamrutham, DhanpatRai Publishing company, New Delhi.
3. Elementary Hydraulics (1st Edition) James F Cruise, Vijay P. Singh, Mohsan M. Sherif, Thomson Learning.
4. Fluid Mechanics, Hydraulic and Hydraulics by K.R. Arora, Standard Book House, New Delhi.
5. Fluid Mechanics, John F. Douglas et al., Pearson Education, India.

**Note: Self study is for 5 marks only in CIE and not in SEE**

#### **Course Outcomes**

**After learning all the units of the course, the student is able to**

1. Apply the knowledge of basic science and mathematics to differentiate a fluid and a solid, understand fluid properties, differentiate pressure and pressure head, analyze the fluid particles at rest or in motion and to understand flow measurement phenomenon. (PO1)
2. Formulate, interpret and analyze flow problems related with fluid particles either at rest or at motion. (PO2, PO3)
3. Identify and quantify losses in a flow phenomenon for the efficient design of pipe line and various

- flow measuring devices. (PO3, PO11).
4. Apply the knowledge of fluid mechanics in future to find efficient solutions to various problems related to civil engineering either as an individual or as a team member to satisfy the changing professional and societal needs. (PO5, PO9, PO11).

**Course Articulation Matrix (CAM)**

Sl.No	Course Outcome-CO's	Program outcome												Program Specific outcome			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
01	Apply the knowledge of basic science and mathematics to differentiate a fluid and a solid, understand fluid properties, differentiate pressure and pressure head, analyze the fluid particles at rest or in motion and to understand flow measurement phenomenon.	1													1	2	
02	Formulate, interpret and analyze flow problems related with fluid particles either at rest or at motion.		3	2												2	2
03	Identify and quantify losses in a flow phenomenon for the efficient design of pipe line and various flow measuring devices.			3								2		1	2		
04	Apply the knowledge of fluid mechanics in future to find efficient solutions to various problems related to civil engineering either as an individual or as a team member to satisfy the changing professional and societal needs.					3				2		1		1	2		

<b>Course Title : APPLIED ENGINEERING GEOLOGY</b>			
<b>Course Code: P17CV36</b>	<b>Semester: III</b>	<b>L – T – P – H : 3– 0 – 0 – 3</b>	<b>Credits:3</b>
<b>Contact Period - Lecture: 40Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %; SEE: 50%</b>	

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Classify different types of minerals.
2. Understand the engineering importance of rocks.
3. Understand the principles of engineering geology and their applications from civil engineering context.
4. Create an engineering geology model.
5. Define Epi-gene and Hypo-gene agents.
6. To understand the origin of earthquake.
7. Identify different types of landslides.
8. Give examples from engineering considerations against earthquake and earthquake resistant structures.
9. Define dip and strike.
10. Classify folds, joints, faults and unconformities

**Relevance of course** : The principles of engineering geology and their applications is used in civil engineering

**Course Content**

**UNIT – I**

Geology and its scope in Civil Engineering, Earth as planet, its structure and composition

**MINERALOGY:** Physical properties of minerals, description of physical properties, chemical composition and use of the following minerals-

Quartz and its varieties, Orthoclase, Plagioclase, Muscovite Mica, Biotite Mica, Olivine, Asbestos, Kaolin, Talc, Garnet, Corundum, calcite, Dolomite, Magnetite, Gypsum, Magnetite, Limonite, Iron pyrite, Chalcopyrite, Pyrolusite, Chromites, Galena, Bauxite

**PETROLOGY:** Igneous, Sedimentary and Metamorphic rocks- description and engineering importance of the following rocks.

- a) **IGNEOUS ROCKS:** General description - important characters- classification - different forms of igneous bodies – textures in igneous rocks - Granite, Syenite, Diorite, Gabbro, Dunite, Porphyries, Pegmatite, Dolerite, Rhyolite, Pumice Stone, Basalt.

**Demonstration : Identification of minerals – physical properties – classification – uses.**

- (b) **SEDIMENTARY ROCKS:** General description - important characters – classification – weathering in sedimentary rocks – Soils formation, Soil profile, Classification of Soils, Erosion and Conservation - primary structural features in sedimentary rocks - Conglomerate, Breccia, Sandstone, shale, Limestone, Laterite.

**Demonstration : Identification of rocks – properties of rocks – textures of rocks - classification – uses.**

**Self study:**METAMORPHIC ROCKS: General description - important characters - different types of metamorphism - Quartzite, Marble, Slate, Phyllite, Schist, and Gneiss **12 Hrs**

**UNIT-II**

**PHYSICAL GEOLOGY**

Epi-gene and Hypo-gene agents, earthquakes- origin, causes, distribution, effects, engineering considerations against earthquake and earthquake resistant structures.

**Self study:** Landslides- their causes, types and preventive measures. **6 Hrs**

**UNIT-III**

**STRUCTURAL GEOLOGY**

Out crop, dip and strike, description and use of compass clinometers, classification of folds, joints, faults and unconformities. Their recognition types, uses – importance's of these structures with reference to geo-technology.

**Problem solving for : i) Calculation of thickness of strata ii) Dip and strike calculation iii) bore well problem calculation.**

**Self study:** Geological mapping – cross section – interpretation. **8Hrs**

**UNIT-IV**

**ENGINEERING GEOLOGY IN SITE INVESTIGATION**

Surface and subsurface investigations for geo-technical problems, Geological considerations in selection site for dams, reservoirs, tunnels, bridges and highways.

**Self study:** Silting up of reservoir and remedial measures. **6Hrs**

**UNIT-V**

**GROUND WATER GEOLOGY**

Hydrological cycle, water bearing properties of soil and different rocks, aquifers types, applications of geological and geophysical methods, electrical resistivity method, interpretation of resistivity curves for groundwater and Civil Engineering purposes. Rainwater harvesting and bore well recharging.

**GEOMETRICS: Application of remote sensing - Geo-graphical Information System (GIS) techniques in Civil Engineering project, Global Position System (GPS) and its use.**

**Self-study:** Rainwater harvesting and bore well recharging **8 Hrs**

**Note: Self study is for 5 marks only in CIE and not in SEE**

**Course Outcomes**

**After learning all the units of the course, the student is able to**

1. Understand the principles of engineering geology and their applications in civil engineering context.
2. Recognize and describe common geological formations with relevance to civil engineering.
3. Demonstrate a basic knowledge of sedimentary, igneous and metamorphic rocks, their formation and occurrence in different tectonic environments.
4. Understand the advanced knowledge and understand the site investigation process for design through testing and interpretation,

**Course Articulation Matrix(CAM)**

Sl.No	Course Outcome-CO's	Program outcome											Program Specific outcome				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	Understand the principles of engineering geology and their applications in civil engineering context.	2													2		
2	Recognize and describe common geological formations with relevance to civil engineering.		2		3											2	
3	Demonstrate a basic knowledge of sedimentary, igneous and metamorphic rocks, their formation and occurrence in different tectonic environments							3									3
4	Understand the advanced knowledge and understand the site investigation process for design through testing and interpretation.				2											2	

**Course Title : BASIC SURVEYING PRACTICE**

<b>Course Code: P17CVL37</b>	<b>Semester: III</b>	<b>L – T – P – H : 0– 0 – 3 – 3</b>	<b>Credits:1.5</b>
<b>Contact Period - Lecture: 39Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %; SEE: 50%</b>	

**Prerequisites :** Basic Surveying

**Course content**

**Exercise – 1:** Introduction to surveying instruments (major and minor) ii) preparation of a chart of conventional symbols and tape.

**Exercise – 2:** Measurement of distance by Ranging and Chaining.

**Exercise – 3:** Determination of area of given polygon by chain & cross-staff survey.

**Exercise – 4:** To set out rectangles, pentagon, hexagon, using tape /chain and compass.

**Exercise – 5:** Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.

**Exercise – 6:** To locate points using radiation and intersection method of plane tabling.

**Exercise – 7:** Determination of elevation of various points by plane of collimation method and rise & fall method.

**Exercise -8:** L-Section and cross section of the road (with necessary drawing)

**Exercise -9:** Conduct block leveling and draw Counter plan of given area (with necessary drawing)

**Exercise-10:** Measurement of horizontal angles with method of repetition and reiteration using theodolite and measurement of vertical angles using theodolite.

**Self study component:**

1. Proposal of layout with standard bye laws (road work or water supply or sewage line)
2. Conduct traverse and calculate total area using planimeter (using compass or plane table)

**REFERENCE BOOKS:**

1. Surveying, Vol.-1, B.C. Punmia, Laxmi Publications, New Delhi.
2. Plane Surveying, Vol-1-A.M. Chandra, Newage International ® Ltd.
3. Plane Surveying, ALAK, S. Chand and Company Ltd., New Delhi.
4. Fundamentals of Surveying - S.K. Roy - Prentice Hall of India.
5. Fundamentals of Surveying - Milton O. Schmidt - Wong, Thomson Learning.
6. Surveying Vol. I, S.K. Duggal

**Scheme of Examination:**

Any one of the above exercise is to be conducted in the examination by the student along with viva and identification of instruments

**Course outcomes**

**Students will be able to**

1. Apply the techniques and skill of basic surveying and mathematics for linear and angular measurements. (PO1)
2. Conduct various types of surveying in the field using conventional surveying tools for plotting and calculations of area, volume and elevation. (PO2, PO3)
3. Proficient in conducting traversing to prepare plans and location of the objects like buildings, tower, bridges, roads. (PO4)
4. Function as a team member with effective communication in completing assigned survey work. (PO4, PO12)

**Course Articulation Matrix (CAM)**

Sl. No	Course Outcome(CO)	Program Outcome (PO)												Program Specific Outcome (PSO)				
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
01	Apply the techniques and skill of basic surveying and mathematics for linear and angular measurements.	1														1		
02	Conduct various types of surveying in the field using conventional surveying tools for plotting and calculations of area, volume and elevation.		2	2													2	
03	Proficient in conducting traversing to prepare plans and location of the objects like buildings, tower, bridges, roads.				3												3	
04	Function as a team member with effective communication in completing assigned survey work.				3								3					3

1-Low, 2-Moderate, 3-High

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<b>Course Title : BASIC MATERIAL TESTNG LAB</b>			
<b>Course Code: P17CVL38</b>	<b>Semester: III</b>	<b>L – T – P – H : 0– 0 – 3 – 3</b>	<b>Credits:1.5</b>
<b>Contact Period - Lecture: 39Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %;</b>	<b>SEE: 50%</b>

**Prerequisites :** Strength of Materials

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Conduct tension test on mild steel and HYSD bars.
2. Conduct compression test of mild steel, cast iron and wood.
3. Conduct bending test on wood under two point loading.
4. Conduct shear test on mild steel.
5. Conduct impact test on mild steel (Charpy and Izod)
6. Conduct hardness tests on ferrous and non-ferrous metals - Brinell's, Rockwell and Vickers tests.
7. Conduct test on bricks and tiles.
8. Conduct tests on fine aggregates - moisture content, specific gravity, bulk density, sieve analysis and bulking.
9. Conduct tests on coarse aggregates - absorption, moisture content, specific gravity, bulk density and sieve analysis.
10. Demonstrate strain gauges and strain indicators

**Relevance of course** : testing of materials for its strength and quality

**Course Content**

**Experiments**

1. Tension test on mild steel and HYSD bars.
2. Compression test on cast iron and wood.
3. Bending test on wood under two point loading.
4. Shear test on mild steel.
5. Impact test on mild steel (Charpy and Izod)
6. Hardness tests on ferrous and non-ferrous metals - Brinell's, Rockwell and Vickers tests.
7. Test on bricks and tiles
8. Tests on fine aggregates - moisture content, specific gravity, bulk density, sieve analysis and bulking.
9. Tests on coarse aggregates - absorption, moisture content, specific gravity, bulk density and sieve analysis.

**Self study component:**. Compression test of mild steel, Demonstration of strain gauges and strain indicators

**Text Book:**

1. Testing of Engineering Materials, Davis, Troxell and Hawk, International Student Edition - McGraw Hill Book Co. New Delhi.
2. Mechanical Testing of Materials, Fenner, George Newnes Ltd, London.

**Reference Books:**

1. Experimental Strength of Materials, Holes K A, English Universities Press Ltd. London.
2. Testing of Metallic Materials, Suryanarayana A K, Prentice Hall of India Pvt. Ltd. New Delhi.
3. Relevant IS Codes
4. Material Testing Laboratory Manual, Kukreja C B- Kishore K. Ravi Chawla Standard Publishers & Distributors 1996.
5. Concrete Manual M.L.Gambhir -Dhanpat Rai & Sons- New Delhi. Scheme of Examination

**Course Outcomes**

**After learning all the units of the course, the student is able to**

1. Identify various building materials and their practical applications.
2. Evaluate the strength of building materials such as bricks, tiles, timber, Steel and physical properties of fine and coarse aggregates.
3. Compute the material hardness
4. Evaluate the charpy and Izod impact strengths.

**Course Articulation Matrix (CAM)**

Sl.No	Course Outcome- CO's	Program outcome												Program Specific outcome					
		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3			
1	Identify various building materials and their practical applications.	2			2											1		2	
2	Evaluate the strength of building materials such as bricks, tiles, timber, Steel and physical properties of fine and coarse aggregates.		2													2			2
3	Compute the material hardness		2												1		2		
4	Evaluate the charpy and Izod impact strengths		2												1		2		



<b>Course Title: Aptitude and Reasoning Development - BEGINNER. (ARDB)</b>			
Course Code : P17HU39	Semester : III	L-T-P-H : 0-0-2-2	Credits: NA
Contact Period: Lecture: 32 Hr. Exam: 3 Hr		Weightage :CIE:100% - [P/NP]	

**Prerequisites:** Basics of mathematics.

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Solve the mathematical calculations easily and quickly using the methods of vedic mathematics.
2. Illustrate different examples to learn about percentages effectively.
3. Compare the different types of series.
4. Explain the logic behind solving problems under series such as A.P., G.P., H.P.
5. Explain divisibility rules, properties of different types of numbers.
6. Explain methods to find the number of factors and sum of factors.
7. Analyze the concept of power cycle, and find last digit and last two digits.
8. Solve problems involving simple equations and inequalities.
9. Explain Componendo, Dividendo, Invertendo, Alternendo and other terms related to ratio and proportion.
10. Explain the concepts behind the logical reasoning modules such as arrangement, blood relations and directions

**Relevance of the course:**

3<sup>rd</sup> Semester is considered as the right time to build a base to a student's analytical and logical ability. This course connects the basics of maths learnt in school into the present problem solving techniques. It creates an awareness towards the importance and significance of an individual's logical abilities.

**Course Content**  
**Unit – I**

**Sharpen your axe!!**

**Vedic mathematics:**

Viniculum and de- viniculum, subtractions using viniculum .Nikhilum multiplication: For numbers close to base values, multiplication of any two digit numbers or three digits number using criss cross method. Finding the square, square root, cubes , cube root of two digit and three digit numbers quickly. Approximation in multiplication and division. Checking the answer using digital sum method

**SSC-** Get hands on multiplication tables, increasing the speed in basic arithmetic operations. Classification of numbers.

**Percentage calculations and ratio comparison:**

**Percentage calculations:** Percentage rule for calculating , percentage values through additions, percentage– fraction table, approximation in calculating percentages. Application based problems

**Ratio comparison:** calculations method for ratio compressions: 1. the cross multiplication method, 2. percentage value compression method 3. numerator and denominator percentage change method. Method for calculating the value of percentage change in the ratio. Application based problems.

**SSC -** Thorough with fractions and decimal values. Applications of tabulated fractions. Product

of means and extremes.

8 Hrs

### Unit – II

#### Analytical Reasoning 1: series

**Number series:** Standard patterns of number series, pure series: perfect square, square cube, prime, combination of this series. Difference series, ratio series, mixed series, geometric series, two-tier arithmetic series, three-tier arithmetic series, change in the order for difference series, change in the order for ratio series, sample company questions.

**Letter series:** Alphabet and Alphanumeric series, finding the missing term based on logic learnt in number series module, continuous pattern series, correspondence series. sample company questions.

**Picture series :** image analysis, addition deletion rotation or modification of lines or shapes. Understanding the symmetry of the image. Mirror image analysis. sample company questions.

**SSC** - Basic knowledge of letter positions, Different number series for example – even, odd, prime, composite etc

6 Hrs

### Unit – III

#### Number system:

Introduction, **Integers:** Remainder zero concept, Odd and Even Integers, Negative and positive integers, power number  $a^x$ , properties of a perfect square number. **Prime number:** General method to identify the prime number, properties of prime numbers. Euler's number. **Factorial number:** Wilson's theorem, important results on factorial. **Divisor:** number of divisors, sum of divisors, number expressed as the product of two factors.

**Divisibility rules:** divisibility of a whole number by a whole number, divisibility of an expression by an expression. **Modulus concept:** divisibility rules in modulus, rules of operations in modulus. **Finding one remainder:** One divisor, remainder of  $(a^n - b^n)$ , remainder for more than one divisor.

**Unit digit:** Concept of power cycle, finding last two digits. Number of trailing zeroes.

**SSC** -Basic arithmetic operations, knowledge about quotient and remainders, multiples and factors.

6 Hrs

### Unit – IV

#### Simple equations, Ratio Proportions and Variations:

**Simple equations:** Linear equations-Linear equations in one variable, linear equation in two variables, Different methods of solving linear equations in two variables– Method of elimination, Method of substitution, Method of cross multiplication. Format of equations that can be converted to linear equations, Linear equations of three variables, Inequalities and its properties. Advanced problems on Simple equations. Age problems.

**Ratio Proportions and Variations:** Understanding the meaning and difference between ratio, proportion and variation. Properties of ratio, Comparison of more than two quantities, Proportion, Properties of proportion - Componendo, Dividendo, Invertendo, Alternendo. Continued proportion, Mean proportion. Variation - Direct variation, Indirect variation, Joint variation, Short cut methods to solve problems on variation.

**SSC** -Knowledge about factors, types of factors. Splitting the middle term rule, formula rule.

6 Hrs

**Unit – V**

**Building the fundamentals of logical reasoning:**

**Arrangement:**

Approach to tackle questions, Different types of arrangement– Linear arrangement, Circular arrangement. Selection, Double line map. Possible ways of arrangement– Words or numbers, left side only, right side only, left right alternate, increasing or decreasing order, interchange vs push, Strategy for solutions– some tips for quick answers, general strategy.

**Directions:**

Basics. Pythagorean theorem, Pythagorean triplets, Solving problems for practice.

**Blood relations:**

Some typical relations that we come across, family tree, Structuring the given problem step by step. Suggested methods– Backtracking, drawing family tree. Problems on blood relations and professions.

**SSC** -Basic knowledge of directions, Pythagoras theorem. Logical reasoning skills, Relations, Family tree. **6 hrs**

**Reference Books:**

1. The Trachtenberg speed system of basic mathematics, published by Rupa publications.
2. CAT Mathematics by AbhijithGuha. published by PHI learning private limited.
3. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
4. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.
5. Quantitative aptitude for CAT by Arun Sharma, published by McGraw Hill publication.
6. Analytical reasoning by M.K Pandey BSC PUBLISHING.CO.PVT.LTD

**Course Outcomes**

**After learning all the units of the course, the student is able to:**

1. Solve mathematical calculations in less duration compared to the conventional method. L2
  2. Give examples for AP, GP and HP and differentiate between them. L1
  3. Apply divisibility rules , power cycle method and evaluate the significance of the number system module. L2
  4. Point out the errors in the problems concerning inequalities and solve simple equations and problems based on ratio, proportion and variation. L5
  5. Solve the problems based on blood relations, directions and arrangement. L4
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<b>Course Title : Additional Maths-I</b>			
Course Code : P17MADIP31	Semester : 3	L:T:P:H : 4:0:0:4	Credits: 0
Contact Period: Lecture: 52 Hr. Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

((Mandatory Learning Course: **Common to All Branches**)  
(A Bridge course for Diploma qualified students of III Sem. B. E.)

**Course Content**

**UNIT -I**

**Complex Trigonometry:** Complex Numbers: Definitions & properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (without proof). Roots of complex number - Simple problems.

**Vector Algebra:** Scalar and vectors. Vectors addition and subtraction. Multiplication of vectors(Dot and Cross products). Scalar and vector triple products-simple problems.

**12Hrs**

**UNIT -II**

**Differential Calculus:** Review of successive differentiation. Formulae for  $n^{\text{th}}$  derivatives of standard functions- Liebnitz's theorem(without proof). Polar curves –angle between the radius vector and the tangent pedal equation- Problems. Maclaurin's series expansions- Illustrative examples. Partial Differentiation : Euler's theorem for homogeneous functions of two variables. Total derivatives-differentiation of composite and implicit function. Application to Jacobians, errors & approximations.

**10 Hrs**

**UNIT -III**

**Integral Calculus:** Statement of reduction formulae for  $\sin^n x$ ,  $\cos^n x$ , and  $\sin^m x \cos^n x$  and evaluation of these with standard limits-Examples. Differentiation under integral sign(Integrals with constants limits)-Simple problems. Applications of integration to area, length of a given curve, volume and surface area of solids of revolution.

**10 Hrs**

**UNIT-IV**

**Vector Differentiation:** Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl and Laplacian (Definitions only). Solenoidal and irrotational vector fields-Problems.

**10 Hrs**

**UNIT-V**

**Ordinary differential equations (ODE's):** Introduction-solutions of first order and first degree differential equations: homogeneous, exact, linear differential equations of order one and equations reducible to above types. Applications of first order and first degree ODE's - Orthogonal trajectories of cartesian and polar curves. Newton's law of cooling, R-L circuits-Simple illustrative examples from engineering field.

**10 Hrs**

**Text Book:**

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi, 42<sup>nd</sup> Ed. 2012.

**References:**

1. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 6<sup>th</sup> Ed., 2007.
2. N.P.Bali and Manish Goyal: Engineering Mathematics, Laxmi Publishers, 7<sup>th</sup> Ed., 2007.

<b>Course Title : ENGINEERING MATHEMATICS-IV</b>			
<b>Course Code : P17MAT41</b>	<b>Semester : IV</b>	<b>L:T:P:H : 3:2:0:5</b>	<b>Credits: 4</b>
<b>Contact Period: Lecture: 52 Hr, Exam: 3 Hr</b>		<b>Weightage: CIE:50%, SEE:50%</b>	

**Course Content**  
**UNIT-I**

Numerical Methods-II: Solution of algebraic and transcendental equations: Bisection method, Regula-Falsi & Newton–Raphson method. Fixed point iteration method: Aitken’s  $\Delta^2$ - process - Illustrative examples only.

Numerical solution of ordinary differential equations (ODE’s): Numerical solutions of ODE’s of first order first degree – Introduction. Taylor’s series method. Modified Euler’s method, Runge - Kutta method of IV order, Milne’s and Adams predictor & corrector methods (All formulae without proof).

**Self-Study Component:** Solution of second order ordinary differential equations using Rung-Kutta methods. Solution of first order simultaneous differential equations.

**10 Hrs**

**UNIT-II**

**Linear Algebra-II:** Introduction to vector spaces – subspaces, Linear combination of vectors, linearly independent/dependent sets; Bases and dimension. Linear transformation - Rank nullity theorem (Statement only). Change of basis. Matrix of linear transformations. (No proof for theorems/properties) - Illustrative examples from engineering field.

**Numerical methods for system of linear equations-** Gauss-Jacobi and Gauss- Seidel iterative methods. Relaxation methods. Determination of largest eigen value and corresponding eigen vector by power method.

**Self-Study Component:** Ramanujan’s Method to find the smallest root of a polynomial.

**10 Hrs**

**UNIT-III**

**Complex Analysis:** Introduction to functions of complex variables. Definitions- limit, continuity and differentiability. Analytic functions. Cauchy–Riemann equations in Cartesian and polar forms problems on properties of analytic functions (No proof). Construction of analytic function: Milne-Thomson method. Conformal transformation–Definitions. Discussion of transformations :  $w = z^2$  ,  $w = e^z$  ,  $w = z + \frac{1}{z}$  ( $z \neq 0$ ) . Bilinear transformations.

**Complex integration:** complex line integrals. Cauchy theorem, Cauchy integral formula. Taylor’s and Laurent’s series (Statements only). Singularities, poles and residues. Cauchy residue theorem (statement only). Simple illustrative examples.

**Self-Study Component:** Derivation of Cauchy- Riemann equation in Cartesian and polar form. Derivation of Cauchy theorem, Cauchy integral formula and Cauchy’s residue theorem.

**11 Hrs**

**UNIT-IV**

**Statistics:** Brief review of measures of central tendency and dispersion. Moments, skewness and kurtosis. Curve fitting-least square method :  $y = a + bx$ ;  $y = ax^b$ ,  $y = ab^x$  and  $y = ax^2 + bx + c$ . Prof. Karl Pearson’s coefficient of correlation and lines of regression.

**Probability Theory:** Brief review of elementary probability theory. Random variables (discrete and continuous)-Introduction to probability distributions- probability mass/density functions and cumulative probability density functions – Illustrative examples. Discrete probability distributions- Binomial and Poisson's distributions; Continuous probability distributions - exponential and normal distributions. (No derivation of mean and variance). Illustrative examples from engineering and industrial fields.

**Self-Study Component:** Basic definitions of probability and problems up to Bayes' theorem. To fit curves of the type  $y = ae^{bx}$ , Derivation of Mean and SD of Binomial & Poisson distribution.

11 Hrs

### UNIT-V

Joint probability distributions and Markov chains:

**Series solutions of ODE's and special functions:** Power series solution of a second order ODE, Series solution-Frobenius method. Series solution leading to  $J_n(x)$ - Bessel's function of first kind. Expansions for  $J_{1/2}(x)$  and  $J_{-1/2}(x)$ . -simple related examples. Series solutions of Legendre's differential equation leading to  $P_n(x)$ -Legendre's polynomials. Rodrigues's formula (No Proof)-simple illustrative examples.

**Self-Study Component:** Basics of Series solutions of ODE's; analytic, singular point and basic recurrence relations.

10 Hrs

#### Text Books:

1. Higher Engineering Mathematics: B.S. Grewal, Khanna Publishers, New Delhi, 42<sup>nd</sup> Ed. 2012.
2. Advanced Engineering Mathematics: - E. Kreyszig, John Wiley & Sons, 10<sup>th</sup> Ed., 2011

#### Reference Books:

1. T. Veerarajan : Engineering Mathematics, Tata McGraw-Hill Pub.,2003.
2. Introductory Methods of Numerical Analysis: - S.S.Sastry, PHI, 3<sup>rd</sup> Ed.2000.
3. Linear Algebra and its applications:- David C.Lay, Pearson Ed. Ltd., 3<sup>rd</sup> Ed, 2003.
4. Seymour Lipschutz : Probability:- Schaum's outline series, McGraw-Hill Pub., 2<sup>nd</sup> Ed, 2002.
5. Higher Engineering Mathematics:- B.V. RAMANA ,McGraw Hill Education , 2007

**Note:** - Each unit contains *two* full questions of *20 marks* each. Students are required to Answer *five* full questions choosing at least *one* question from each unit.

**Note:** Self study is for 5 marks only in CIE and not in SEE

### Course Outcomes

After learning all the units of the course, the student is able to;

1. Apply the familiarity of numerical methods for solving algebraic and transcendental equations and demonstrate single-step and multi-step numerical methods for solving ordinary differential equations and interpret the solution in engineering applications.

2. Describe the concept of vector space, subspace, basis, dimension and their practical utility in matrix of linear transformations required in the area of graphics, analysis of graphs, internet search, machine learning and scientific computing etc. And, understand the procedure of numerically solving large systems of linear algebraic equations and obtaining eigen value and eigen vector corresponding to a large eigen vector, with the aid of standard methods of numerical linear algebra
3. Explain the concept of analyticity and potential fields through complex functional /potential, conformal transformations and interpret the solution in fluid flow and electromagnetic problems and describe the process of complex integration and learn series representation of a function of complex variables, residues and poles.
4. Apply the knowledge of statistics in interpretation the data, fitting of a linear and non-linear curves of best fit for experimental data arising in engineering calculations and analyze the same by expressing in the form of regression lines. And, Illustrate the concept of random variables (discrete/continuous) and related probability distributions and use them in analyzing and solving engineering problems associated with probability model.
5. Define the concept of joint probability of two random variables and apply the knowledge of joint probability distribution in interpreting data through statistical measure. and, analyze the notion of higher transition probabilities, the Markov chain and queuing models arising in engineering problems for feasible random events.  
Obtain series solution of essential ODE's such as Bessel's and Legendre's differential equations and understand their scientific/engineering utility

**Course Articulation Matrix (CAM)**

<b>Title : Engineering Mathematics –IV</b>												
<b>CO's</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
CO-1	2	2	-	-	-	-	-	-	-	-	-	-
CO-2	3	3	-	-	-	-	-	-	-	-	-	-
CO-3	3	3	-	-	-	-	-	-	-	-	-	-
CO-4	2	2	-	-	-	-	-	-	-	-	-	-
CO-5	3	3	-	-	-	-	-	-	-	-	-	-

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<b>Course Title : CONCRETE TECHNOLOGY</b>			
<b>Course Code: P17CV42</b>	<b>Semester: IV</b>	<b>L – T – P – H : 4– 0 – 0 – 4</b>	<b>Credits:4</b>
<b>Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %; SEE: 50%</b>	

**Prerequisites :** Building materials and construction

### Course Content

#### Course Learning Objectives (CLOs)

**This course aims to**

1. Cite the basic knowledge of science and engineering of concrete properties related to civil engineering problems.
2. Distinguish between coarse aggregate & fine aggregate and their properties.
3. Understand workability and its effects on strength of concrete.
4. Understand durability of hardened concrete
4. Describe chemical admixtures and mineral admixtures.
5. Explain hardened concrete and its strength properties.
6. Summarize curing, factors affecting creep and shrinkage.
7. To imbibe the culture of professional and ethical responsibilities by following codal provisions in concrete mix design for strength and durability.
8. Demonstrate tests on hardened concrete.
9. To have the knowledge of advanced concrete technology.

#### **UNIT – I**

**CONCRETE INGREDIENTS AND MICROSTRUCTURE:** Cement – Chemical composition, hydration of cement, types of cement, manufacture of OPC with flow charts. Bogue’s compound, Tests on cement – field testing, fineness, normal consistency, setting time, soundness, and compressive strength (detailed procedures covered in laboratory). Quality of mixing water. Fine aggregate – grading of aggregates, sieve analysis, specific gravity, bulking, moisture content, deleterious materials. Coarse aggregate – importance of size, shape and texture, grading of aggregates, sieve analysis, specific gravity, flakiness and elongation index, crushing, impact and abrasion tests (detailed procedures to be covered in laboratory)

**Self study component:** Alkali- aggregate reaction, Manufactured sand its significance.

**12Hrs**

#### **UNIT-II**

**RHEOLOGY OF FRESH CONCRETE:** Workability – definition, factors affecting workability, measurement of workability by slump, compaction factor, Vee-bee, flow tests. Segregation and bleeding, process of manufacture of concrete – batching. Mixing, transporting, placing, compaction, curing of concrete. chemical admixtures – plasticizers, accelerator, retarders. Mineral admixtures – fly ash, blast furnace slag, meta-kaolin, GGBS

**Self study component:** Mineral & chemical admixtures – Silica fumes and rice husk ash and air entraining agents.

**10Hrs**



**UNIT – III**

**HARDENED CONCRETE:** Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, effect of aggregate properties, compressive strength, tensile strength, bond strength, modulus of rupture, modulus of elasticity, the relationship between these parameters, aggregate-cement bond strength. Shrinkage – plastic shrinkage and drying shrinkage, factors affecting shrinkage. Creep – Measurement of creep, factors affecting creep, effect of creep.– compressive strength, non-destructive testing of concrete. (Detailed test procedures to be covered in laboratory).

**Self study component:** Tests on hardened concrete- split tensile strength, flexural strength, Poisson ratio. **10Hrs**

**UNIT – IV**

**Concrete mix design:** Concept of mix design, variables in proportioning, exposure conditions, factors, affective mix design, design of concrete mix by BIS method using IS: 10262. Provision in revised IS code 10262- 2009, numerical examples of mix design.

**Durability of concrete-**introduction, permeability of concrete, chemical attack, Sulphate attack, acid attack, efflorescence, corrosion in concrete, thermal conductivity, thermal diffusivity, specific heat.IS456-2000 requirement for durability. Factors contributing cracks in concrete-plastic shrinkage, settlement cracks construction joints.

**Self study component:** Codal provisions for durability of concrete, Introduction to current British (BS) code, Mix design by ACI code. **10Hrs**

**UNIT-V**

**Progress in concrete Technology:** Properties and uses of High strength Concrete, Self-compacting concrete, Polymer impregnated concrete, High performance concrete and Roller compacted concrete, Geo-polymer concrete, fibre-reinforced concrete, light weight concrete, Translucent concrete,

**Self study component:** Bacterial concrete, Whisper concrete. **10Hrs**

**Text Book:**

1. M.S. Shetty, “Concrete Technology” - Theory and Practice, S.Chand and Company, New Delhi, 2002.
2. Gambhir B L, Concrete Technology, Tata McGraw Hill, New Delhi.

**Reference Books:**

1. Neville, A M, Properties of concrete, ELBS Publications.
2. IS: 10262 – Recommended guidelines for Concrete Mix design – BIS Publications.
3. Mehta PK, Properties of Concrete, ICI, Chennai

**Note: Self study is for 5 marks only in CIE and not in SEE**

**Course Outcomes**

**After learning all the units of the course, the student is able to**

1. Apply the knowledge of science and engineering to acquire the fundamentals of cement, aggregates and admixtures.(PO1,PO12)
2. Conduct investigations to select suitable materials for concrete.(PO4,PO12)
3. Design special concrete as per selected codes.(PO3,PO12)
4. Apply the concept of durability of concrete for sustainability.(PO7,PO12)

**Course Articulation Matrix (CAM)**

Sl. No	Course Outcome-CO's	Program outcome												Program Specific outcome		
		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
01	Apply the knowledge of science and engineering to acquire the fundamentals of cement, aggregates and admixtures.	2	3										1	2		
02	Conduct investigations to select suitable materials for concrete.	2	2										2	1	2	
03	Design special concrete as per selected codes.	2	3										3	1	2	
04	Apply the concept of durability of concrete for sustainability.	2	3										1	1	2	

**Course Title : BASIC STRUCTURAL ANALYSIS**

<b>Course Code: P17CV43</b>	<b>Semester: IV</b>	<b>L – T – P – H : 4– 0 – 0 – 4</b>	<b>Credits:4</b>
<b>Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %;</b>	<b>SEE: 50%</b>

**Prerequisites :**Strength of Materials

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Identify structural form, idealization, stability and determinacy.
2. Analyze the trusses.
3. Determine deflection of beams by different methods.
4. Use necessary energy concept to find deformations in beams, frames and trusses.
5. Analyze cable structures
6. Analyze thrust, shear and bending moment in three hinged arches.
7. Use of influence lines for distributed loads and rolling loads.
8. Analyze statically indeterminate beams using consistent deformation method.
9. Analyze statically indeterminate structures using Clapeyoran's three of three moment equation .
10. Solve numerical problems.

**Relevance of course:** Analysis of structures is necessary in civil engineering

**Course Content**

**UNIT – I**

**Structural form, idealization, stability and determinacy:** Skeletal or one, two, three dimensional structures, idealization of structures, Principle of superposition. Degree of static and kinematic indeterminacy in structures. Solve problems

**Plane trusses:** Introduction, assumptions, different types of trusses, methods of analysis of simple plane trusses - Method of joints Solve problems and introduction to methods of sections. ( No numerical )

**Deflection in beams –** Introduction, differential equation of deflection curve, Macaulay's method for beam subjected to point loads and udl. **10 Hrs**

**Self-Study Component:** Numericals on methods of sections

**UNIT-II**

**Deflection:** Conjugate beam method- Introduction, support conditions for the conjugate beams Numerical on cantilever beams, simply supported beams

Moment area method -Introduction, equation for slope and deflection, Numerical on cantilever, simply supported beams

**Self-Study Component:** Deflection beams subjects to couple. **10 Hrs**

**UNIT-III**

**Cable structures:** Introduction, analysis of cable subjected to concentrated loads, uniformly distributed vertical loads, length of cable, cable passing over pulley and saddle- Solved problems.

**Three hinged arches:** Circular and parabolic arches with supports at same levels and different levels, determination of thrust, shear and bending moment - Solved problems

**Self-Study Component:** Different types of arches with their key features **10 Hrs**

**UNIT – IV**

**Influence line diagram and rolling loads:**Introduction to influence line diagram, uses, difference between ILD and BMD, construction of ILD for support reactions, shear force and bending moments in simply supported beam subjected to point loads and udl shorter than span

**Introduction to Energy Methods:** Introduction, Castigliano's theorem, Betti's law and Maxwell's law, determination of deflection and slope of beams by Strain energy method

**Self-Study Component:** ILD for UDL greater than span. **10 Hrs**

**UNIT-V**

**Introduction to statically indeterminate structures:** Introduction to indeterminate structures, Analysis of Propped cantilever beam by consistent deformation method

**Analysis of statically indeterminate structures by three moment equation.** (with static indeterminacy  $\leq 3$ ): Introduction - Analysis of continuous beam using Clapeyran's theorem of three moments, settlement of supports. Solved problems.

**Self-Study Component:** Introduction to fixed beams **12 Hrs**

**Text Book:**

1. Theory of structures Vol 1– S.P.Gupta G.S. and R Gupta Pandit and, - Tata Mc-Graw Hill, New Delhi.
2. Basic structural analysis - Reddy C S – Second Edition, Tata Mc-Graw Hill, New Delhi.

**Reference Books:**

1. Strength of materials and theory of structures Vol 1 & Vol 2, Punmia B C, Jain R K, Laxmi publications, New Delhi.
2. Elementary structural analysis - Norris and Wilber, International student edition, Mc-Graw Hill Co. New York.
3. Classical structural analysis - A modern approach, Anthony. E. Armenakad, Mc-Graw Hill international edition, New York

**Note: Self study is for 5 marks only in CIE and not in SEE**

**Course Outcomes**

**After learning all the units of the course, the student is able to**

1. Identify structural forms, degree of determinacy and apply the knowledge of mathematics, science and engineering to solve problems on trusses and beams
2. To apply the knowledge of deflection for the analysis of beams by different methods.
3. To analyze cables and three hinged arches and to apply the concept of influence lines for distributed loads and rolling loads
4. To apply the knowledge of strain energy and three moment equation to analyze statically indeterminate structures

**Course Articulation Matrix (CAM)**

Sl.No	Course Outcome-CO's	Program outcome												Program Specific outcome		
		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
01	Identify structural forms, degree of indeterminacy and apply the knowledge of mathematics, science and engineering to solve problem on trusses.	2	3											2	2	
02	To apply the knowledge of deflection for the analysis of beams by different methods.	2	3											2	1	2
03	To analyze cables and three hinged arches and to apply the concept of influence lines for distributed loads and rolling loads.	2	3											1	1	2
04	To apply the knowledge of strain energy and three moment equation to analyze statically indeterminate structures.	2	3											2	1	2

<b>Course Title : APPLIED SURVEYING</b>			
<b>Course Code: P17CV44</b>	<b>Semester: IV</b>	<b>L – T – P – H : 4– 0 – 0 – 4</b>	<b>Credits:4</b>
<b>Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %;</b>	<b>SEE: 50%</b>

**Prerequisites :** Basic Surveying

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Compute elevation and difference in elevation of objects when the base is accessible and inaccessible.
2. Illustrate tachometric surveying and using different methods of tachometric surveying.
3. To determine elevation and difference in elevation of objects.
4. Construct simple curves, compound curves, and reverse curves using Rankine's deflection angle and other methods.
5. Design and computation of transition curve vertical curves.
6. Understand Geographic information system.
7. Understand Global positioning systems.

**Course Content**

**UNIT – I**

**Trigonometric Levelling:** Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method, distance and difference in elevation between two inaccessible objects by double plane method. Numerical problems.

**Tacheometric Surveying :** Basic principle, types of tachometric survey, tachometric equation for horizontal line of sight and inclined line of sight in fixed hair method, anallactic lens in external focusing telescopes, reducing the constants in internal focusing telescope,.

**Self study component:** Moving hair method and tangential method, Subtense bar. **10 Hrs**

**UNIT-II**

**Curve Setting-Simple curves:** Curves - necessity, types, simple curves, elements of curves, designation of curves, setting out simple curves by linear methods, setting out curves by Rankine's deflection angle method.

**Compound curve:** Compound curves, elements of Compound curves, relationship between elements of compound curve for different cases. design of compound curves, setting out of compound curves.

**Self study component:** Setting out simple curve by two theodolite method. **10 Hrs**

**UNIT-III**

**Curve Setting -reverse, Transition, vertical curves:** reverse curve between two parallel and non parallel straights (Equal radius and unequal radius), Numerical problems.

Transition curves characteristics, length of transition curve, setting out cubic parabola and Bernoulli's lemniscates Numerical problems

**Vertical Curves :** Types of vertical curves, length of vertical curves, computation and setting out of a vertical curve, sight distance. Numerical problems.

**Self study component:** Reasons to avoid reverse curves, Necessity and requirement of transition curve

**12 Hrs**

**UNIT – IV**

**Total Station Instrument:** Introduction, basic concepts, measurement of distance using phase difference, components of total station, adjustments, Errors, accuracy, effect of atmospheric conditions.

**Remote sensing:** Introduction, components and working principle and area of application. Advantages and disadvantages, types of remote sensing, Different types of platforms, Electromagnetic radiation, Electromagnetic spectrum, atmospheric windows, spectral signature.

**Self study component:** Advantages, limitations and uses of total station. Types of remote sensors.

**10 Hrs**

**UNIT – V**

**Global Positioning Systems:** Global positioning systems, segments of GPS, working principle, Hand held GPS and differential GPS, methods of GPS surveying, Errors and accuracy.

**Geographic information system:** Introduction to Geographic information system, components and flow diagram of GIS, working/ functions of GIS, four M's, Advantages, applications of GIS.

**Self study component:** Advantages and disadvantages and applications of GPS. Data types of GIS.

**10 Hrs**

**Text Book:**

1. Surveying, Vol 1,2 and 3 - B. C. Punmia , Laxmi Publications.
2. Plane Surveying, A. M. Chandra - New age international ( P) Ltd.

**Reference Books:**

1. Higher Surveying A.M. Chandra New age international (P) Ltd.
2. Fundamentals of Surveying - Milton O. Schmidt - Wong, Thomson Learning.
3. Fundamentals of Surveying - S.K. Roy - Prentice Hall of India.
4. Surveying, Arther Bannister et al., Pearson Education, India.

**Note: Self study is for 5 marks only in CIE and not in SEE**

**Course outcomes**

**After learning all the units of the course, the student is able to**

1. Apply the knowledge of basic surveying to determine distance & elevation by trigonometric leveling, tachometric surveying
2. Analyze different curves for roads and railways
3. Interpret surveying data to design curves
4. Understand the principles and techniques of modern surveying equipments and their applications

**Course Articulation Matrix (CAM)**

Sl.No	Course Outcome-CO's	Program outcome												Program Specific outcome					
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3			
01	Apply the knowledge of basic surveying to determine distance & elevation by trigonometric leveling, tachometric surveying	3														1	2		
02	Analyze different curves for roads and railways	2				3										1		3	
03	Interpret surveying data to design curves			2													2		2
04	Understand the principles and techniques of modern surveying equipments and their applications				2												1		3

<b>Course Title : HYDRAULICS &amp; HYDRAULIC MACHINES</b>			
<b>Course Code: P17CV45</b>	<b>Semester: IV</b>	<b>L – T – P – H : 4– 0 – 0 – 4</b>	<b>Credits:4</b>
<b>Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %; SEE: 50%</b>	

**Prerequisites :** Knowledge of Mechanics of rigid, deformable and fluids

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Differentiate open channel flow and pipe flow, classify open channels, compute the discharge in different types of channel sections and design most economical channel sections.
2. Find critical depth and critical velocity in open channels, know about hydraulic jump and its uses, and compute depth of hydraulic jump and loss of energy due to hydraulic jump in open channels.
3. Identify the number of variables in a phenomenon and establish relationship between the variables from the experimental data.
4. Find the impact of jet on various types of vanes; find the efficiency of the jet, work done by the jet on series of flat vanes and curved vanes which is the basis of the next units.
5. Characterize a hydro-electric power plant, classify the turbines and design the components of turbines.
6. Predict and distinguish the performance of different turbines under different conditions and to know working of centrifugal pumps, its use in multistage pumps as per the requirement.

**Course Content**

**UNIT – I**

**Flow in Open Channels:** Definition of open channels, classification, difference between pipe flow and open channel flow, types of flow, geometric properties of open channels. Uniform flow in open channels, Chezy's and Manning's formulae. Problems on uniform flow. Most economical sections of open channels. Derivation of conditions for most economical rectangular, triangular and trapezoidal channel sections. Problems. Specific energy, specific energy curve, condition for minimum specific energy and maximum discharge, Critical flow in rectangular channels, problems. Hydraulic jump in rectangular channels, derivations with Froude's number concept. Venturi flume, Problems on Hydraulic Jump.

**Self study component – Practical channel sections. 12 Hrs**

**UNIT-II**

**Dimensional Analysis and Model analysis:** Introduction to dimensional analysis, units and dimensions, table of dimensions. Dimensional homogeneity, methods of dimensional analysis - Raleigh's and Buckingham's method. Problems on Raleigh's and Buckingham's method. Model studies, introduction, comparison with dimensional analysis, similitude, dimensionless parameters. Types of models, Froude's models theory and problems, Reynold's models, theory and problems.

**Self study component – Scale effect in models. 10 Hrs**

**UNIT-III**

**Impact of Jet on Vanes:** Introduction to impulse - momentum equation and its applications, Derivation of force exerted by a jet on a stationary target (vertical plates and curved plates only) Derivation of force exerted by a jet on a moving target (vertical plates and curved plates only) Force exerted by the jet on a series of flat vanes and series of curved vanes. Equation for work done and efficiency, problems. Force exerted by the jet, work done and efficiency on a



unsymmetrical curved moving vane- concept of velocity triangles, Force exerted by the jet on a series curved radial vanes mounted on a wheel. (Excluding inclined plates and hinged plates).

**Self study component** – Force exerted and work done by the jet on inclined vanes. **10 Hrs**

**UNIT-IV**

**Hydraulic Turbines:** Introduction, types and classifications of turbines, general layout of a hydroelectric power plant. Pelton wheel turbine - theory, equation for work done and efficiency, design parameters. Problems on Pelton wheel turbine. Francis turbine - theory, equation for work done and efficiency, design parameters, problems on Francis turbine, Kaplan turbine - theory, equation for work done and efficiency, design parameters, problems on Kaplan turbine.

**Self study component** – Governing of turbines. **10Hrs**

**UNIT-V**

**Performance of Hydraulic Turbines:** Draft tubes: Types, equation for efficiency, problems, specific speed of a turbine, equation for the specific speed, problems, unit quantities of a turbine, definitions, equations and problems, characteristic curves of a turbine.

**Centrifugal Pumps:** Definition of pump, classification, description and general principle of working, priming methods, work done and efficiencies of a centrifugal pump, minimum starting speed, cavitation in centrifugal pumps, multistage centrifugal pumps, problems on centrifugal pumps.

**Self study component** – Iso-efficiency curves. **10Hrs**

**Text Book:**

1. Hydraulics and fluid mechanics, Modi and Seth Standard Book House, New Delhi.
2. Fluid mechanics and machinery, Raghunath. H M., CBS Publishers.
3. Text Book on fluid mechanics and hydraulic machines, Bansal R.K., Laxmi publications.

**Reference Books:**

1. Fluid mechanics and hydraulic machines, S.C. Gupta, Pearson Education, India.
2. Hydraulics and fluid mechanics, K.R. Arora, Standard Book house, New Delhi.
3. Hydraulic Machines, (6th edition) by Banga, T.R. and Sharma, S.C., Khanna Publishers.

**Note: Self study is for 5 marks only in CIE and not in SEE**

**COURSE OUTCOMES.**

**After learning all the units of the course, the student is able to**

1. Understand, classify, formulate and analyze problems related with open channel, hydraulic jump, impact of jet on vanes, pumps, turbines and to do dimensional analysis and model analysis. (PO1, PO2)
2. Compute the discharge in different types channel sections, design most economical channel sections, analyze and interpret the data of various flow phenomenon to establish relationship among the variables in flow phenomenon, (PO3, PO4, PO11)
3. Select the models of various hydraulic structures, design the components of Turbines and Centrifugal pumps and evaluate the performance of Turbines and Centrifugal pumps under different conditions. (PO3, PO5)
4. Apply the knowledge of open channel flow, hydraulic machines and model analysis in future to work effectively either as an individual or as a team member to satisfy the changing professional and societal needs. (PO5, PO9, PO11)

**Course Articulation Matrix (CAM)**

Sl.No	Course Outcome-CO's	Program outcome												Program Specific outcome			
		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	
01	Understand, classify, formulate and analyze problems related with open channel, hydraulic jump, impact of jet on vanes, pumps, turbines and to do dimensional analysis and model analysis.	3	2												3		
02	Compute the discharge in different types channel sections, design most economical channel sections, analyze and interpret the data of various flow phenomenon to establish relationship among the variables in flow phenomenon.			3	2								2		2	3	
03	Select the models of various hydraulic structures, design the components of Turbines and Centrifugal pumps and evaluate the performance of Turbines and Centrifugal pumps under different conditions.			3	2											3	
04	Apply the knowledge of open channel flow, hydraulic machines and model analysis in future to work effectively either as an individual or as a team member to satisfy the changing professional and societal needs.					3				2		1		1	2	3	

<b>Course Title : HIGHWAY ENGINEERING</b>			
<b>Course Code: P17CV46</b>	<b>Semester: IV</b>	<b>L – T – P – H : 3– 0 – 0 – 3</b>	<b>Credits:3</b>
<b>Contact Period - Lecture: 40Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %; SEE: 50%</b>	

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Importance of Transportation and Different modes of transportation.
2. Importance of Roads in India and Current Road development programmes in India.
3. Importance of Geometric Design, Design control and criteria.
4. Highway cross section elements - Cross slope or Camber, Medians, Carriageway, Kerbs, Road Margins, Cross section details.
5. Steps for construction of a New Highway, Design and Construction of highway embankment.
6. Construction of sub-grade, Construction of WBM base course.
7. Object of Highway Pavements, Requirements of Highway Pavements.
8. Types of Pavement Structures and comparisons & their limitations.
9. Importance of Highway maintenance works.
10. Failures in different flexible pavement layers.

**Relevance of course:** Highway engineering is needed in construction of roads and railways.

**Course Content**

**UNIT – I**

**Principles of transportation engineering, highway development & planning:** Importance of transportation. Different modes of transportation, characteristics and comparison of different modes. Importance of roads in India, scope of highway engineering, road development in India during 20<sup>th</sup> and 21<sup>st</sup> century, highway planning, classification of roads, planning surveys and interpretations, determination of optimum road length by saturation system, third twenty years road development plan (problems).

**Self study component:** Highway alignment, engineering surveys for highway alignment, highway projects, detail project report (DPR). **9 Hrs**

**UNIT – II**

**Geometric design of highways:** Importance of geometric design, design control and criteria, highway cross section elements - cross slope or camber, medians, carriageway, kerbs, road margins, cross section details, right of way, sight distance, stopping sight distance (SSD), overtaking sight distance (OSD), design of horizontal alignment - design speed, horizontal curves, super elevation, widening of pavement on horizontal curves, transition curves.

**Self study component:** Vertical alignment – gradient, vertical curves, summit curves, valley curves. Problems on above. **9 Hrs**

**UNIT – III**

**Highway materials and highway construction:** Materials used in highway construction, soil compaction, CBR test, stone aggregates, properties and tests, bituminous binders- types, functions and tests, bitumen emulsion, Portland cement and cement concrete. Bituminous paving mixes. Highway constructions – typical components of highway pavement, steps for construction of a new highway, design and construction of highway embankment and sub-grade, construction of flexible pavements, construction of wet mix macadam base, construction of WBM base course, prime coat, tack coat, cc pavements – general features of plain and reinforced cc

pavements, component of cc pavement and their functions,

**Self study component:** Construction method of CC pavement using slip-form pavers, construction using fixed form and mechanized technique. **8 Hrs**

**UNIT – IV**

**Design of highway pavements:** Object of highway pavements, requirements of highway pavements, types of pavement structures and comparisons & their limitations, flexible/rigid pavements – components and their functions, factor affecting design and performance of flexible/rigid pavements, design methods: flexible pavements design methods – CBR method of pavement design, pavement design as per IRC guidelines.

Rigid pavements, types of joints in cc pavements and their functions.

**Self study component:** Rigid pavement design methods – using stress equations, as per IRC guidelines, design problems. **7 Hrs**

**UNIT – V**

**Highway maintenance and highway drainage:** Importance and objectives of highway maintenance works, pavement deterioration and damages in road infrastructures, classification of highway maintenance works.

Highway drainage- objects of highway drainage, requirements and importance, surface drainage system and design, cross drainage structures, sub-surface drainage system, design of filter material, drainage of slopes and erosion controls, road construction in water-logged areas. Design problems.

**Self study component:** Distress in flexible and rigid pavements and maintenance measures.

**7 Hrs**

**TEXT BOOK:**

1. Highway Engineering – S.K. Khanna, C.E.G Justo, and A.Veeraragavan, Nem Chand and Bros, Roorkee, Revised 10<sup>th</sup> Edition.
2. Highway Engineering- Kadiyali, L.R., Khanna Publishers, New Delhi.
3. Traffic Engineering and Transport Planning – L.R. Kadiyali, Khanna Publishers, New Delhi.
4. Transportation Engineering – Subramanyam, K.P., Scitech Publications, Chennai

**REFERENCE BOOKS:**

1. Relevant IRC codes
2. Principles of Transportation Engineering- Partha Chakra Borthy, Prentice- Hall.
3. Specifications for Roads and Bridges- MoRT & H, IRC, New Delhi

**Note: Self study is for 5 marks only in CIE and not in SEE**

**Course Outcomes**

**After learning all the units of the course, the student is able to**

1. Apply the knowledge of science and engineering to acquire the fundamentals of road transportation, engineering surveys and project preparation. (PO1, PO12)
2. Design of horizontal alignment and sight distance in relation to safety and driver comfort and design of vertical alignment. (PO3, PO12)
3. Analyze and design of highway cross section elements and sight distance. (PO2, PO3, PO12)
4. Analyze and design flexible and rigid pavements as per IRC and measure of distress. (PO2, PO3, PO8, PO12)

**Course Articulation Matrix(CAM)**

Sl. No	Course Outcome – CO	Program outcome												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
01	Apply the knowledge of science and engineering to acquire the fundamentals of road transportation, engineering surveys and project preparation.	1											3	1		
02	Design of horizontal alignment and sight distance in relation to safety and driver comfort and design of vertical alignment.			1									2		1	
03	Analyze and design of highway cross section elements and sight distance.		2	1									2		1	3
04	Analyze and design flexible and rigid pavements as per IRC and measure of distress.		2	1				2					2		1	

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<b>Course Title : APPLIED SURVEYING PRACTICE</b>			
<b>Course Code: P17CVL47</b>	<b>Semester: IV</b>	<b>L – T – P – H : 0– 0 – 3 – 3</b>	<b>Credits:1.5</b>
<b>Contact Period - Lecture: 39Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %; SEE: 50%</b>	

**Prerequisites :** Applied Surveying

**Course content**

**Exercise - 1:** To determine the elevation of the top of a tower/building using single plane method when base object accessible and inaccessible for different cases.

**Exercise - 2:** To determine the elevation of the top of a tower/building using double plane method and to find difference in elevation between two elevated objects.

**Exercise - 3:** To determine the tachometric constants using horizontal and inclined line of sight. And find the distance and elevation of the object.

**Exercise - 4:** To set out simple curves using linear methods - perpendicular offsets from long chord and offsets from chords produced.

**Exercise - 5:** To set out simple curves using Rankin’s deflection angles method.

**Exercise - 6:** To set out compound curve with angular methods using theodolite only.

**Exercise - 7:** Introduction to total station, components, temporary adjustments.

**Exercise - 8:** Horizontal and vertical distance using Total Station

**Exercise - 9:** Traversing and area calculation using Total Station

**Demonstration:** GPS, usage of relevant software for preparation of the contour drawings.

**Self Learning Exercise:** Detailed survey of an area including creation of job file, selecting appropriate point codes, measurement of coordinates, downloading of data and preparation of layout detailing / area measurement / contour map / column marking, using e-surveying software.

**REFERENCE BOOKS:**

1. Surveying, Vol.-1, 2 and 3 B.C. Punmia, Laxmi Publications, New Delhi.
2. Plane Surveying, Vol-1-A.M. Chandra, Newage International ® Ltd.
3. Plane Surveying- S. Chand and Company Ltd., New Delhi.
4. Fundamentals of Surveying - S.K. Roy - Prentice Hall of India.
5. Fundamentals of Surveying - Milton O. Schmidt - Wong, Thomson Learning.

**Course Articulation Matrix (CAM)**

Sl.No	Course Outcome-CO's	Program outcome												Program Specific outcome				
		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3		
01	Apply the knowledge & principles of basic surveying for setting out work like curves, buildings, highways	2													1	2		
02	Proficient in handling modern surveying equipment & interpret data for preparation of plans & contours			2		2									1		2	
03	Gain knowledge to plan survey work to prepare drawings like boundary, location of objects, Topography				2										1		1	
04	Function as a Team member with effective communication in completing the assigned survey work													2	2	1		2

**Scheme of Examination:**

Any one of the above exercise is to be conducted in the examination by the student, Viva-voce and identification of simple instruments

<b>Course Title : HYDRAULICS &amp; HYDRAULIC MACHINE LAB</b>			
<b>Course Code: P17CVL48</b>	<b>Semester: IV</b>	<b>L – T – P – H : 0 – 0 – 3 – 3</b>	<b>Credits:1.5</b>
<b>Contact Period - Lecture: 39Hrs.; Exam: 3Hrs.</b>		<b>Weightage: CIE: 50 %;</b>	<b>SEE: 50%</b>

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Calibrate the flow measuring devices
2. Evaluate the losses in pipe flow and efficiency of jets striking stationary flat and Hemispherical vanes
3. Predict the Performance of Pelton wheel turbine and Kaplan turbine / Francis turbine
4. Evaluate the design discharge and design head of a given centrifugal pump

**Course Content**

- Ex 1: Calibration of V-notch.
- Ex 2: Calibration of rectangular or Trapezoidal notch.
- Ex 3: Calibration of Ogee weir.
- Ex 4: Calibration of Broad crested weir.
- Ex 5: Calibration of Venturi flume.

Ex 6: Calibration of Venturi meter.

Ex 7: Determination of Darcy's friction factor for a straight pipe.

Ex 8: Determination of minor loss constants. (Bend, Elbow, Sudden contraction, sudden expansion)

Ex 9: Determination of vane coefficient for stationary flat and hemispherical vanes.

Ex 10: Determination of hydraulic coefficient of a vertical orifice.

Ex 11: Performance tests on a single stage or multi stage centrifugal pump (constant speed).

Ex 12: Performance tests on a Pelton wheel.

Ex 13: Performance tests on Francis or Kaplan turbine.

**Self study component:** Identification of different types of jumps in open channels.

**Text Books:**

1. Hydraulics and fluid mechanics, Modi and Seth Standard Book House, New Delhi.
2. Fluid mechanics and machinery, Raghunath. H M., CBS Publishers.
3. Text Book on fluid mechanics and hydraulic machines, Bansal R.K., Laxmi publications.

**Reference Books:**

1. Fluid mechanics and hydraulic machines, S.C. Gupta, Pearson Education, India.
2. Hydraulics and fluid mechanics, K.R. Arora, Standard Book house, New Delhi.
3. Hydraulic Machines, (6th edition) by Banga, T.R. and Sharma, S.C., Khanna Publishers

**Course Outcomes**

**After learning all the units of the course, the student is able to**

1. Calibrate flow measuring devices used in pipes, channels and tanks (PO3, PO4)
2. Evaluate and analyze various losses and loss coefficients in pipes (PO2, PO12)
3. Evaluate the performance characteristics of turbines and pumps (PO4, PO12)

**Course Articulation Matrix (CAM)**

Sl. No	Course Outcome-CO's	Program outcome												Program Specific outcome			
		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	
01	Calibrate flow measuring devices used in pipes, channels and tanks.			2	2										2		
02	Evaluate and analyze various losses and loss coefficients in pipes.		3										2		2	2	
03	Evaluate the performance characteristics of turbines and pumps.				3								2		2	2	



<b>Course Title : Aptitude and Reasoning Development - Intermediate (ARDI)</b>			
Course Code : P15HU49	Semester : IV	L - T - P : 2-0 - 0 - 2	Credits: 01
Contact Period: Lecture: 32 Hr. Exam: 3 Hr		Weightage: CIE:50%;SEE:50%	

**Prerequisites: ARDB**

**Course Learning Objectives (CLOs)**

**This course aims to**

1. Explain proportionality rule, average speed, relative speed and concepts in circular track.
2. Explain the application of time, speed distance in solving problems related to races, trains, boats and streams, and clocks.
3. Explain different methods to calculate number of smaller cubes, the date and the day of any year and the concepts of clocks.
4. Explain the methodology of strengthening or weakening the given statement.
5. Explain application of Venn diagrams in solving set theory problems.
6. Explains the concept of syllogism and provides the methodology to tackle the problems.
7. Describes all the important properties of triangle, polygons, circle and other geometrical figures and solve application based questions.
8. Describe the properties of cone, cylinder, sphere, cube and cuboid and solve the application based questions.
9. Differentiates between individual work and group work.
10. Integrates the concept of individual work in solving problems related to pipes and cisterns

**Relevance of the course:**

4<sup>th</sup> semester deals with more of quantitative aptitude. It is the intermediate level of aptitude which involves modules like Time speed distance. Time and work, set theory. This course also touches upon logical abilities through modules like cubes and Calendars.

**Course Content**

**Unit – I**

**Time, Speed and Distance:**

Concept of motion and mathematical representation of motion, The rule of proportionality, Conversion between kmph to m/s, Concept of average speed and its application in different scenarios, Relative speed– Importance, application and observation in day to day life, same direction and opposite direction, An application of allegation in Time speed and distance, Trains– Different scenarios. Boats and streams– resultant speed, upstream and downstream concept. Circular motion– Two or three bodies meeting at the starting point or anywhere in the track. Races– Concept of head start, solving problems under different constraints. Application of solving problems under Clocks.

**SSC:** Basic relation between the 3 different quantities. Conversions between different units of measurement. Speed and velocity.

**6 Hrs**

**Unit – II**

**Cubes, Clocks & Calendars:**

**Cubes:** Number of faces, vertices and edges. Colored cubes. Number of colored faces and the formulae to find-out the same. Problems on cubes.

**Clocks & Calendars:** Minute spaces. Hour hand and minute hand. Angle between the hands. Relative speed. Faulty clocks. Time gained or lost by the clock. Odd days. Leap year. Ordinary year. Counting of odd days. Problems on clocks and calendars.

**Self-study Component-** Knowledge about shapes and dimensions, Area and volume. Leap year, number of days. Important dates. **8 Hrs**

### Unit – III

**Set theory and Venn diagram:** Set builder form, Tabular form, Venn diagram, Types of sets, Operation of sets using venn diagram, Important properties, Algebraic laws of sets, Maxima and minima in set operation, Venn diagram for four sets.

**Syllogism:** Meaning of syllogisms, Format of problems and standard qualifiers, Concept of distribution, Standard question pattern, Application of venn diagram to solve problems. **Logical Venn diagrams:** Analysis of the given problem and solve it.

**Self-study Component-** Basics about sets, operations using venn diagram. Basic applications. **6 Hrs**

### Unit – IV

#### Geometry and Mensuration:

Theory, straight lines, triangles– theorems, area, lines inside triangle and geometric centre, Special property of an equilateral triangle, Application of Pythagoras theorem, Congruency and similarity of triangles, Basic proportionality theorem, Polygons, Quadrilaterals, Trapezium, Parallelogram, Rectangle, Rhombus, Square, Division of polygons, Circumscribed and Inscribed polygons, Concyclic points concept, Cyclic quadrilateral, Circle– Radius, Area and perimeter, Arc, Chord, Sector, Segment, Tangent, Secant, Area of common region Solid figures– Introduction, Classification of a solid, Net of a solid, Cuboid, Cube, Right cylinder, Pyramid– right pyramid, triangular pyramid, Cone– frustum of a cone, Sphere, Combination of solid.

#### Co-ordinate geometry:

Cartesian coordinate geometry– rectangular coordinate axis, distance formula, Section formula, Area of a triangle, Centre of gravity or Centroid of a triangle, In-centre of a triangle, Circumcentre of a triangle, Orthocentre of a triangle, Collinearity of three points, Slope of a line, Different forms of equations of a straight line, Perpendicularity and parallelism, Length of perpendicular.

**Self-study Component-**Basics of geometry, formula, dimensions, shapes. Different types of lines. Example – parallel, intersecting etc... **8 Hrs**

### Unit – V

#### Time and Work:

Relationship between time and work. Importance of efficiency, Conventional method of solving problems, L.C.M method, Negative work, The specific case of building a wall, Group work, Constant product rule, When work is not constant, Pipes and cistern– Similarity of logic.

**SSC:** LCM methods, basic arithmetic. Fractions and efficiency. **4 Hrs**

#### Reference Books:

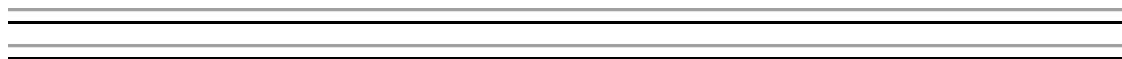
1. The Trachtenberg speed system of basic mathematics, published by Rupa publications.
2. CAT Mathematics by Abhijith Guha. published by PHI learning private limited.
3. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
4. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.
5. Quantitative aptitude for CAT by Arun Sharma, published by McGraw Hill publication.
6. Analytical reasoning by M.K Pandey BSC PUBLISHING.CO.PVT.LTD

**Course Outcomes (CO)**

**After learning all the units of the course, the student is able to:**

1. Solve problems of higher difficulty level with ease in the following topics– Time , speed and distance and Geometry. L5
2. Analyze the number of colored faces in a cube when it is cut into different number of pieces and solve the problems under clocks and calendars. L5
3. Apply the concept of L.C.M in the module time and work to solve the problems with comprehension. L2
4. Analyze the concepts in Co-ordinate geometry by spatial visualization. L4
5. Interpret the logic in the statements of syllogism by critical thinking and apply venn diagram for the effective ways of deriving at the conclusion. L4
6. Determine the solutions for complicated problems of set theory using the concept of venn diagram. L4

<b>Course Articulation Matrix</b>															
<b>Course Outcomes</b>		<b>Program Outcomes</b>												<b>PSO</b>	
		1	2	3	4	5	6	7	8	9	10	11	12	01	02
<b>CO1</b>	Solve problems of higher difficulty level with ease in the following topics– Time, speed and distance and Geometry.	3	2	2	-	1	-	-	-	-	-	-	-	-	-
<b>CO2</b>	Analyze the number of colored faces in a cube when it is cut into different number of pieces and solve the problems under clocks and calendars.	-	2	2	2	-	-	-	-	-	-	-	-	-	-
<b>CO3</b>	Apply the concept of L.C.M in the module time and work to solve the problems with comprehension.	-	2	2	-	1	-	-	-	1	-	1	-	-	-
<b>CO4</b>	Analyze the concepts in Co-ordinate geometry by spatial visualization.	3	2	2	2	1	-	-	-	-	-	-	-	-	-
<b>CO5</b>	Interpret the logic in the statements of syllogism by critical thinking and apply venn diagram for the effective's ways of deriving at the conclusion.	-	2	2	2	-	-	-	2	-	2	-	-	-	-
<b>CO6</b>	Determine the solutions for complicated problems of set theory using the concept of venn diagram.	-	2	2	2	-	-	-	-	2	-	1	-	-	-



<b>Course Title : Additional Mathematics-II</b>			
Course Code : P17MADIP41	Semester : 4	L :T:P:H : 4:0:0:4	Credits: 0
Contact Period: Lecture: 52 Hr. Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

((Mandatory Learning Course: **Common to All Branches**)  
(A Bridge course for Diploma qualified students of IV Sem. B. E.)

**Course Content**

**UNIT –I**

**Linear Algebra:** Introduction - Rank of matrix by elementary row operations - Echelon form of a matrix. Consistency of system of linear equations - Gauss elimination method. Gauss-Jordan and LU decomposition methods. Eigen values and eigen vectors of a square matrix. Application of Cayley-Hamilton theorem(without proof) to compute the inverse of a matrix-Examples.

**10 Hrs**

**UNIT –II**

**Higher order ODE's:** Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. Solutions of initial value problems. Method of undetermined coefficients and variation of parameters. Solution of Cauchy's homogeneous linear equation and Legendre's linear differential equation.

**14 Hrs**

**UNIT –III**

**Multiple Integrals:** Double and triple integrals-region of integration. Evaluation of double integrals by change of order of integration.

**Vector Integration :** Vector Integration :Integration of vector functions. Concept of a line integrals, surface and volume integrals. Green's, Stokes's and Gauss theorems (without proof) problems. Orthogonal curvilinear coordinates.

**10 Hrs**

**UNIT –IV**

**Laplace transforms:** Laplace transforms of elementary functions. Transforms of derivatives and integrals, transforms of periodic function and unit step function-Problems only. Inverse Laplace transforms: Definition of inverse Laplace transforms. Evaluation of Inverse transforms by standard methods. Application to solutions of Linear differential equations and simultaneous differential equations.

**12 Hrs**

**UNIT –V**

**Probability:** Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability – illustrative examples. Bayes's theorem-examples.

**06 Hrs**

**Text Book:**

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi,42<sup>nd</sup> Ed. 2012.

**References:**

1.E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 6<sup>th</sup> Ed., 2007

2.N.P.Bali and Manish Goyal: Engineering Mathematics, Laxmi Publishers,7<sup>th</sup> Ed., 2007.