SYLLABUS

(With effect from 2015-2016 Academic year)

ಪಠ್ಯಕ್ರಮ

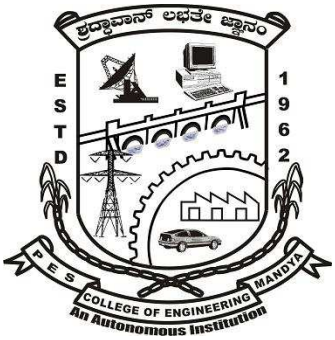
(ಶೈಕ್ಷಣಿಕವರ್ಷ 2015–16)

III & IV Semester

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 in the academic year 2008-09. Since, then it has been doing the academic and examination activities successfully. The college is running Eight undergraduate and Eight Postgraduate programs. It consists of Six M.Tech programs, which are affiliated to VTU. Other postgraduate programs are MBA and MCA.

India has recently become a Permanent Member by signing the Washington Accord. The accord was signed by the National Board of Accreditation (NBA) on behalf of India on 13th 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 such as Taiwan, Hong Kong, Ireland, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Turkey, Australia, Canada and Japan. Among other signatories to the international agreement are the US and the UK. Implementation of Outcome Based Education (OBE) has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the countries.

Our Higher Educational Institution has adopted the CBCS based semester structure with OBE scheme and grading system.

The credit based OBE semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching.

The OBE, emphasize setting clear standards for observable, measurable outcomes of programs in stages. There lies a shift in thinking, teaching and learning processes moving towards Students Centric from Teacher Centric education. OBE standards focus on mathematics, language, science, attitudes, social skills & moral values.

The key features which may be used to judge, if a system has implemented an outcome based education system is mainly Standard based assessments that determines whether students have achieved the stated standard. Assessments may take any form, so long as the process actually measure whether the student knows the required information or can perform the required task. Outcome based education is a commitment that all students of all groups will ultimately reach the same minimum standards. Outcome Based Education is a method or means which begins with the end in mind and constantly emphasizes continuous improvement.

Choice Based Credit System (CBCS) provides choice for students to select from the prescribed courses (core, Foundation, Foundation Elective, elective, open elective and minor or soft skill 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 to learning which enables integration of concepts, theories, techniques, and, perspectives from two or more disciplines to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline. These greatly enhance the skill/employability of students.

In order to increase the Industry/Corporate readiness, many Soft Skills and Personality Development modules have been added to the existing curriculum of the academic year 2015-16. Industry Interactions have been made compulsory to enhance the field experience. In order to enhance creativity and innovation Mini Project and Industrial visit & Interaction are included in all undergraduate programs

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Deputy Dean (Academic)
Associate Professor,
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(Dr.P S Puttaswamy)
Dean (Academic)
Professor,
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PES College of Engineering

Vision

"An institution of high repute, imparting quality education to develop innovative and Humane engineers"

Mission

"Committed to develop students potential through high quality teaching- learning processes and state of the art infrastructure"

DEPARTMENT OF CIVIL ENGINEERING

About the Department

The Civil Engineering Department was started in the year 1962 as one of the first branches inP.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 programmes to the students. The department is running an undergraduate programme with an intake of 120 and it has started PG inn CAD structures with an intake of 18 in the year 2004. The department has been recognized as research center 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 facilities. The department has well qualified and experienced teaching faculties. The department also takes up consultancy work pertaining to civil engineering. Planning, structural design of buildings, testing of materials, testing of materials, soil investigation is part of the department activities.

VISION :

Department of Excellence developing engineers to address construction challenges.

MISSION:

Committed to

- Develop faculty, staff and students
- Create and nurture ambience for learning, innovation and research
- Develop new construction materials and technology
- Partner in developing skilled labour through vocational programmes

(A) Programme Educational Objectives (PEOs)

The Bachelor of Engineering Programme in Electronics and Communication Engineering [B.E. (Civil)] during four years term aims to

I. Provide the students with strong fundamental and advanced knowledge in mathematics, science and engineering with respect to Civil Engineering discipline with an emphasis to solve engineering problems

II. Prepare the students through well - designed curriculum to excel in bachelor degree programme in Civil Engg. in order to engage in teaching or industrial or any technical profession and to pursue higher studies

III. Train students with intensive and extensive engineering knowledge and skill so as to understand, analyze, design and create novel products and solutions in the field of Civil engineering.

IV. Inculcate in students the professional and ethical attitude, effective communication skills, team spirit, multidisciplinary approach and ability to relate engineering issues to broader social context.

V. Provide students with an excellent academic environment to promote leadership qualities, character moulding and lifelong learning as required for a successful professional career.

(B) Programme Outcomes (POs):

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

a) An ability to apply knowledge of mathematics, science and engineering to develop art of planning and executing constructional activities.

b) An ability to design and construct Civil Engineering structures

c) An ability to function effectively as an individual and as a member of engineering teams of other disciplines.

d) An understanding of professional and ethical responsibility at local, national and international levels.

g) An ability to effectively communicate orally and in writing on social and technical occasions in local and global scenarios.

h) The broad education to understand the impact of engineering solutions in a global and societal context.

i) An ability to engage in independent and lifelong learning in the broad context of technological change.

j) A knowledge of contemporary issues at local, national and international levels.

k) An ability to use the techniques, skills and modern engineering software tools which are necessary for engineering practice.

These programme outcomes (POs) are achieved through an array of courses. To ensure the achievement of POs, the course learning outcomes (CLOs) are so formulated that they address the POs.

P.E.S. College Of Engineering, Mandya
(An Autonomous Institution)
Scheme of Teaching and Examination

III Semester B.E.								**(Civil)**
Sl No	**Course Code**	**Course Title**	**Teaching Dept.**	**Hrs/Week L:T:P:H**	**Credit**	**Examination Marks**		
						CIE	SEE	Total Marks
1.	P15MAT31	Course I - Engineering Mathematics -III	Maths	3:2:0:5	4	50	50	100
2.	P15CV32	Building Materials & Construction	Civil	4:0:0:4	4	50	50	100
3.	P15CV33	Strength of Materials	Civil	4:0:0:4	4	50	50	100
4.	P15CV34	Applied Engineering Geology	Civil	3:2:0:5	3	50	50	100
5.	P15CV35	Fluid Mechanics	Civil	4:0:0:4	4	50	50	100
6.	P15CV36	Basic Surveying	Civil	4:0:0:4	4	50	50	100
7.	P15CVL37	Basic Surveying Practice	Civil	0:1:2:3	1.5	50	50	100
8.	P15CVL38	Basic Material testing lab	Civil	0:1:2:3	1.5	50	50	100
9.	P15HUDIP39	Comprehensive communication development (CCD)	HS&M	2:0:0:2	[2]	[50]	[50]	[100]
10.	P15HU39	Aptitude and reasoning development - Beginner(ARDB)	HS&M	2:0:0:2	0	(50)	--	--
11.	P15MADIP31	*Additional Maths-I	Maths	4:0:0:4	0	--	---	---
13	P15HMDIP310	Indian Constitution , Human rights & Professional Ethics	Human& Science	2:0:0:2	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)**
Sl No.	**Course Code**	**Course Title**	**Teaching Dept.**	**Hrs/Week L:T:P:H**	**Credit**	**Examination Marks**		
						CIE	**SEE**	**Total Marks**
1.	P15MAAC41^{+}	Course I -Engineering Mathematics-IV	Maths	3:2:0:5	4	50	50	100
2.	P15CV42	Concrete technology	Civil	4:0:0:4	4	50	50	100
3.	P15CV43	Basic Structural Analysis	Civil	4:0:0:4	4	50	50	100
4.	P15CV44	Applied Surveying	Civil	4:0:0:4	4	50	50	100
5.	P15CV45	Hydraulics & hydraulic machines	Civil	4:0:0:4	4	50	50	100
6.	P15CV46	Highway Engineering	Civil	3:0:0:3	3	50	50	100
7.	P15CVL47	Applied Surveying practice	Civil	0:1:2:3	1.5	50	50	100
8.	P15CVL48	Hydraulics & hydraulics machines lab	Civil	0:1:2:3	1.5	50	50	100
9	P15HU49	Aptitude and reasoning development - Intermediate(ARDI)	HS&M	2:0:0:2	1	50	50	100
10	P15MADIP41	*Additional Maths-II	Maths	4:0:0:4	0	--	--	--
11	P15EVDIP410	*Environmental Studies	Civil	2:0:0:2	0	--	--	--
Total					27	450	450	900

*** Additional Mathematics-II & Environmental Studies: Lateral entry students shall have to pass these mandatory learning courses before completion of VI- Semester**

L: Lecture, T: Tutorial, P: Practical CIE: Continuous internal evaluation, SEE semester end Examination

Evaluation Scheme (For Theory Courses only)							
Scheme	**Weightage**	**Marks**	**Event Break Up**				
			Test I	**Test II**	**Quiz I**	**Quiz II**	**Assignment**
CIE	50%	50	35	35	5	5	10
SEE	50%	100	**Questions to Set: 10**		**Questions to Answer: 5**		

Course Title: Engineering Mathematics-III			
Course Code: P15MA31	**Semester:** III	**L – T – P – H :** 3– 2 – 0 – 5	**Credits:** 04
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		**Weightage:** CIE: 50 %;	SEE: 50%

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 P15MA31 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.

Central differences: Gauss Forward and Backward difference formulae, Stirling's, and Bessel's formulae (All formulae without proof) – Illustrative problems. **10 Hrs**

UNIT-II

Numerical differentiation using Newton's forward and backward interpolation formulae, Newton's divided difference formula and Stirling'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 $(\frac{1}{3})^{rd}$ rule, Simpson's $(\frac{3}{8})^{th}$ rule, Boole's rule and Weddle's rule (All rules without proof)- Illustrative problems. **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. **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 – problems. Convolution theorem, Parseval's identities for Fourier transforms (statements only).

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

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. **11 Hrs**

Text Books:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi,42^{nd} Ed. 2012.

2 .Advanced Engineering Mathematics: - E. Kreyszig, John Wiley & Sons, 6^{th} Ed.2007.

References:

1. Advanced Modern Engineering Mathematics:- Glyn James,Pearson Education Ltd., 3rd Ed., 2007.

2. Peter V O' Neil – Advanced Engineering Mathematics, Thomson Brooks/Cole ,5th edition,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.

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.

Engineering Mathematics-III(P15MA31)

Time - 3Hrs Max. Marks- 100

Note: Answer any FIVE full questions choosing at least one full question from each unit

Model Question Paper	Marks	CO's	Levels
UNIT- I			
1. a) Find the missing values in the following data:			
x | 0 | 1 | 2 | 3 | 4 | 5 | 6 y | 5 | 11 | 22 | 4 | __ | 140 | __	6	1	L1
b) The table gives the distances in nautical miles of the visible horizon for the given heights (in feet) above the earth's surface: x = height | 100 | 150 | 200 | 250 | 300 | 350 | 400 y = distance | 10.63 | 13.03 | 15.04 | 16.81 | 18.42 | 19.9 | 21.27	7	1	L2
Find the values of y when $x = 410\ ft$.	7	1	L2
c) Given $u_{20} = 24.37, u_{22} = 49.28, u_{29} = 162.86$ and $u_{32} = 240.5,$ find u_{28} by Newton`s divided difference formula.			
2. a) Use Lagrange interpolation to fit a polynomial to the following data. x | 0 | 1 | 3 | 4 y | -12 | 0 | 6 | 12 Hence find f (1.5) and f(5).	6	1	L2
b) Using Gauss backward difference formula, find y(8) from the following table: X: 0 5 10 15 20 25 Y: 7 11 14 18 24 32	7	1	L2
c) Using sterlings formula find y_{35} given $y_{20} = 512,\ y_{30} = 439,\ y_{40} = 346,\ y_{50} = 243$	7	1	L3

UNIT- II			
3 a).Given the data x | -2 | -1 | 0 | 1 | 2 | 3 y | 0 | 0 | 6 | 24 | 60 | 120 Compute $y''(2)$ and $y''(4)$	6	2	L3
b) Find the $f''(6)$ from the following data X: 0 2 3 4 7 8 Y: 4 26 58 112 466 922 using Newton's divided difference formula	7	2	L3
c) The table below reveals the velocity v of a body during the specific time t , Find the acceleration at t=1.1 t: 1.0 1.1 1.2 1.3 1.4 v: 43.1 47.7 52.1 56.4 60.8	7	2	L3
4 a) Find the approximate value of $\int_0^{\pi/2} \sqrt{\cos\theta}\, d\theta$ by Simpson's $1/3^{rd}$ rule by dividing $[0,\ \pi/2]$ into 6 equal parts.	6	2	L2
b) Use Boole's formula to compute $\int_0^{\pi/2} e^{\sin x}\, dx$	7	2	L2
c) Evaluate $\int_0^1 \frac{x\,dx}{1+x^2}$ by Weddle's rule taking seven ordinates and hence find $\log_e 2$.	7	2	L2

UNIT- III

5. (a) If f(x)= x(2π – x) in 0≤ x ≤ 2π, obtain the Fourier series of f(x)	6	3	L2
(b) Find a Fourier series in $[-\pi,\pi]$ to represent $f(x)=x-x^2$. Hence deduce that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\cdots\cdots=\frac{\pi^2}{12}$.	7	3	L2
(c) Draw the graph of the function $f(x)=\begin{cases}\pi x, & 0\le x\le 1\\ \pi(2-x), & 1\le x\le 2\end{cases}$ and Express f(x) as a Fourier series	7	3	L3
6 (a) Obtain the complex Fourier series of $f(x)=\begin{cases}0, & 0<x<l\\ a, & l<x<2l\end{cases}$ over $[0,2l]$.	6	3	L2
(b) Find the cosine half range series for $f(x)=x(l-x);\ 0\le x\le l$	7	3	L3
(c) Express y as a Fourier series up to the third harmonic given the following data:	7	3	L3

x	0	π/3	2π/3	π	4π/3	5π/3	2π
y	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

UNIT- IV

7. (a) Find the Fourier transform of $f(x)=\begin{cases}1-x^2, & \lvert x\rvert<\alpha\\ 0, & \lvert x\rvert\ge\alpha\end{cases}$ and hence find the value of $\int_0^\infty \frac{x\cos x-\sin x}{x^3}dx$	6	4	L2
(b) Find the Fourier sine transform of f(x) = $e^{-\lvert x\rvert}$ and hence evaluate $\int_0^\infty \frac{x\sin mx}{1+x^2}dx,\ m>0$.	7	4	L2
(c) Solve the integral equation $\int_0^\infty f(x)\cos\alpha x\,dx=e^{-a\alpha}$.	7	4	L3
8. (a) Obtain the Z-transform of cos nθ and sin nθ.	6	4	L1
(b) Compute the inverse Z-transform of $\frac{3z^2+2z}{(5z-1)(5z+2)}$	7	4	L2
(c) Solve by using Z-transforms: $y_{n+2}+2y_{n+1}+y_n=n$ with $y_0=0=y_1$.	7	4	L3

UNIT- V

9 (a). Form the partial differential equations by elimination of arbitrary function in $f(x^2+2yz,y^2+2xz)=0.$	6	5	L1
	7	5	L3
(b). Solve by the method of separation of variables $4\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=3u$ given that $u(0,y)=2e^{5y}.$	7	4	L2
	10	5	L3
(c). Solve: $(mz-ny)p+(nx-lz)q=(ly-mx).$			
10 (a) Find the various possible solutions of the one dimensional heat equation $\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}$ by the method of separation of variables	10	5	L3
(b) Solve the wave equation $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(0,t)=0,\ u(l,t)=0$ for $t\ge 0$ and $u(x,0)=0,\ \frac{\partial u}{\partial t}(x,0)=x(l-x),\ 0\le x\le l.$			

Course Title : Building Materials & Construction			
Course Code : P15CV32	**Semester :** III	**L - T - P :** 4 - 0 - 0	**Credits:** 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hrs		**Weightage:** CIE:50; SEE:50	

Prerequisites : Nil

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.

Relevance of course: Building materials are the basic materials in civil engineering and for construction**.**

Course Content

Unit-1

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. 10 Hrs

Unit-2

Foundation: **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, pile foundations (friction and load bearing piles), foundation in black cotton soil (or expansive soil) . 10 Hrs

Unit-3

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, 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

Unit – 4

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 and 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, paneled doors, , flush doors, collapsible and rolling shutters, Types of windows- paneled, glazed, bay window, dormer window, louvered and corner window, ventilators. 12 Hrs

Unit 5

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. 5 Hrs

Introduction to cost effective construction, miscellaneous topics: Necessity, advantages, prefabrication techniques, pre-cast doors and windows (pre-cast frames and shutters), alternative building materials, hollow concrete blocks, stabilized mud blocks, micro concrete tiles, pre-cast roofing elements.

Miscellaneous topics: Form work, form work details, RCC columns, beams floors, slip forming and damp proof construction. 5 Hrs

Text Book:

1. Building Construction by S.C. Rangwala, Charter Publishing House, Anand, India.
2. Building Construction by Sushil Kumar, Standard Publication and Distributors, New Delhi.

Reference Books:

1. Building Construction by Punmia B.C., Lakshmi Publications, New Delhi.
2. Advanced Building Materials and Construction by Mohan Rai and Jai Sing, CBRI Publications, Roorkee

Course Outcomes

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

1. Understand different types of construction materials.
2. Understand importance of preliminary investigation of soil, bearing capacity of soil, different types of foundations, pile foundation, well foundation and foundation in expansive soil
3. Classify Bonds in brick work, English bond, Flemish bond, Joints in stone masonry, arches.
4. Distinguish between Scaffolding, Shoring and underpinning, types of flooring etc. and method of construction.
5. Identify types of footing, RCC, raft and pile foundations in different soils.

P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belgaum)

P15CV32 **Model question paper** *Page No... 1*

Third Semester, B.E. - Civil Engineering
Building Materials and Construction

Time: 3 hrs Max. *Marks: 100*

***Note** : i) Answer **FIVE** full questions, selecting **ONE** full question from each Unit.*
ii) Assume suitable missing data if any.

Unit - I

1. a. List the qualities of good building stones. 10
b. List the qualities of good bricks. 10

2 a. Explain any five defects of timber. 10
b. Explain any two method of seasoning of timber. 10

Unit - II

3 a. Define SBC of soil. Explain the methods which are used to improve SBC of soil. 10
b. Write a note on foundations in black cotton soil. 10

4. a. Draw neat sketches of (i) Raft footing and (ii) Combined footing. 10
b. Explain different types of pile foundations. 10

Unit - III

5 a. Differentiate between English bond and Flemish bond. Draw sketches. 10
b. Write a note on reinforced brick work. 10

6 a. Explain with a neat sketch pit type underpinning. 10
b. Explain the stages of laying polished marble flooring. 10

Unit - IV

7 a. Draw a neat sketch of wood queen Post roof truss for a span of 12 m and label the parts. 10
b. Explain the requirements of ideal staircase. 10

8 a. Explain collapsible door with a neat sketch. 10
b. With a neat sketch write a note on dormer window. 10

Unit - V

9 a. Explain the purpose of (i) Painting and (ii) Plastering 10
b. Explain the procedure involved in polishing wood. 10

10a. List the advantages and disadvantages of pre fab construction. 10
b. Write a note on damp proof construction. 10

Course Title : Strength of Materials			
Course Code : P15CV33	**Semester :** III	**L - T - P :** 4 - 0 - 0	**Credits:**4
Contact Period: Lecture: 52 Hr, Exam:3Hr		**Weightage:** CIE:50; SEE:50	

Prerequisites: Engineering Mechanics

Course Learning Objectives (CLOs)

This course aims to

1. Understand the concept of deformable bodies and mechanical 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, simple stresses and strain, compressive, tensile and shearing stress, Hook's law, and Poisson's ratio, stress - strain diagram, ultimate strength, working stress, .factor of safety and elastic constants and their relationships, volumetric strain, expressions and problems. Total elongation of tapering bars of varying circular and rectangular cross sections, elongation due to self weight and problems, state of simple shear stress and strain continued: Composite section, composite bars and columns, thermal stresses (including thermal stresses in compound bars) and problems. 10 Hrs

Unit -2

Compound stresses: Introduction, stress components on inclined planes, general two dimensional stress system, principal planes and stresses at a point and problems, analysis of principal stresses and strain for various cases of two dimensional stress system. Mohr's circle of stresses and problems.

Thick and thin cylinders: Introduction, thin cylinders under internal pressure, difference between thick and thin cylinders, Lame's theory, thick cylinders under internal pressure and external pressure. 10 Hrs

Unit-3

Bending moment and shear force in beams: Introduction, statically determinate beams, shearing force in beam, bending moment, and sign conventions. Relationship between loading, shear force and bending moment, shear force and bending moment equations. Shear force diagram and bending moment diagrams with salient values for cantilever beams, simply supported beams and overhanging beams subjected to gravity loads and their combinations and couple. 10 Hrs

Unit – 4

Bending stresses and shear stresses in beams : Introduction, bending stress in beam, simple bending theory, assumptions in simple bending theory, pure bending derivation of Bernoulli's equation, 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. 12Hrs

Unit-5

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

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

10 Hrs

Text Book:

1. Strength of Materials: 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: Basavarajaiah and Mahadevappa, Khanna Publishers, New Delhi.

Reference Books:

1. Strength of Materials: Singer Harper and Row Publications.
2. Elements of Strength of Materials: Timoshenko and Young Affiliated East-West Press.
3. Mechanics of Materials: James M. Gere (5th Edition), Thomson Learning.

Course Outcomes

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

1. Understand the concept of deformable bodies and mechanical properties of engineering materials. Apply the Knowledge of elasticity and evaluate the performance of deformable bodies under the action of different kinds of loads and composite sections and effect of temperature of various structural elements.
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. Understand the concept of pressure vessels; distinguish between thick & thin cylinders.
3. Understand the concept of BM and SF and to sketch SFD and BMD for statically determinant beams.
4. Understand the concept of bending stress and shear stress and to sketch them for beams.
5. Understand the concept of torsion of circular shaft and deflection of beam.

Model question paper -P15CV33
Strength of Materials

Time: 3 hrs *Max. Marks: 100*

***Note** : i) Answer **FIVE** full questions, selecting **ONE** full question from each Unit.*
ii) Assume suitable missing data if any..

Unit - I

1. a. State and explain any three types of strains. 6
b. How do you explain i) ultimate stress ii) working stress iii) factor of safety. 6
c. Derive an expression for the volumetric strain of a cylindrical rod of diameter 'd' and length '*l*' . 8

2 a. Derive an expression for the elongation of a tapering rod of diameter d1 at one end to a diameter d2 at the other end.

10

b. A straight bar of steel rectangular in section is 3 m long and is of uniform thickness 15 mm. The width of the rod varies uniformly from 100 mm at one end to 40 mm at the other. If the rod is subjected to an axial tensile load of 30 kN, find the extension of rod. Take ES = 2x105 N/mm2.

10

UNIT - II

3 a. What are principal stresses and planes? 4
b. What is Mohr's circle of stresses? 4
c. The principal tensile stresses at a point across two perpendicular planes are 80 N/mm2 and 40 N/mm2. Find the normal tangential stress and the resultant stress and its obliquity on a plane at 20º with the major principal plane. Find also the intensity of stress which acting alone can produce the same maximum span. Take Poisson's ratio = ¼. 12

4. a. Differentiate between thick and thin cylinders. 4
b. A shell 3.25 m long, 1 m in diameter is subjected to an internal pressure of 1 N/mm2. If the thickness of the shell is 10 mm, find the circumferential and longitudinal stresses. Find the circumferential and longitudinal stresses. Find also the maximum shear stress and the change in the dimensions of the shell. Take E = 2x105 N/mm2 and 1*m* □□0.3 16

UNIT - III

5 a. Derive the relationship between loading, shear force and bending moment 6
b. A simply supported beam of span 9 m carriers a uniformly distributed load of 18 kN/m for a distance of 4 m from the left support A. Draw SFD and BMD. Also calculate the values of maximum BM and SF.

14

6 a. How do you distinguish between sagging and hogging bending moments? 4
b. Show that the shape of BM of a simply supported beam carrying udl throughout the span is parabolic and maximum BM is $wl^2/8$.
c. Sketch the SFD and BMD for the beam shown in Fig. Q 6(c). Also locate the position of contra flexure, if any. 10

UNIT - IV

7 a. State the assumptions in the bending theory. 5
b. With usual notations derive the expression *M /I = f/y*□□□R 5
c. A rolled steel Joist of I section has the following dimensions: flange: 250mm wide and 24mm thick , Web: 12 mm thick, Overall depth: 60 mm If this beam carries a uniformly distributed load of 50 kN/m runs on a span of 8 m. Calculate the maximum stress produced due to bending. 10

8 a. Derive the differential equation for slope and deflection. 6

b. A Beam of uniform section is 10m long and is simply supported at ends. It carries concentrated

loads of 100 kN and 60 kN at distance of 2m and 5m respectively from the left end. Calculate the deflection under each load. Find also the maximum deflection. Take I = 18x108 mm4 and E = 2x105 N/mm2. 14

UNIT - V

9 a. Derive the torsion equation $f/R=q/r= C$□□□l 8

b. A Solid circular shaft transmits 100 BHP at 200 rpm. Calculate the shaft diameter if the twist in the shaft is not to exceed 1º in 2 m length of shaft and the shearing stress is limited to 50 N/mm2. Take $F_C = 1x10^5$N/mm2. 12

10a. Derive the Euler's buckling load for a one end fixed and other end hinged column. 6

b. How do you distinguish between short and long column. 4

c. An ISMB 250 RSJ is to be used as a column 4 m with one end fixed and the other end hinged.Find the safe axial load on the column allowing a factor of safety of 3.Take; FC = 320 N/mm2 and □□□□□□7500 .

Properties of column sections are;

Area = 4755mm2, Ixx = 5131.6x104 mm4, Iyy = 334.5x104 mm4 10

Course Title : APPLIED ENGINEERING GEOLOGY			
Course Code : P15CV34	**Semester :** III	**L - T - P :** 3 - 2 - 0	**Credits:** 3
Contact Period: Lecture: 52Hr, Exam:3 Hr		**Weightage:** CIE:50; SEE:50	

Prerequisites: Nil

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 verities, 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.

(c) **METAMORPHIC ROCKS**: General description - important characters - different types of metamorphism - Quartzite, Marble, Slate, Phyllite, Schist, and Gneiss. 18 Hrs

Unit-2

PHYSICAL GEOLOGY

Epi-gene and Hypo-gene agents, earthquakes- origin, causes, distribution, effects, engineering considerations against earthquake and earthquake resistant structures. **Landslides-** their causes, types and preventive measures. 6 Hrs

Unit-3

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.

Demonstration: Geological mapping – cross section – interpretation.

Problem solving for: i) Calculation of thickness of strata ii) Dip and strike calculation iii) bore well problem calculation. 10Hrs

Unit-4

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. Silting up of reservoir and remedial measures. 8Hrs

Unit-5

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.

10 Hrs

Text Book:

1. Parbin Singh., **"A Text book of Engineering and General Geology"-** Sixth revised edition- 2011 Published by – S K Kataria & Sons, New Dehli-51.

Reference Books:

1. **B.S. Satyanarayana swamy, "A text book of Engineering Geology"** 2000 edition. Dhanpat rai & Co. (P) Ltd., Delhi-111006
2. K.M. Bangar , "**Principles of Engineering Geology"-** First edition- 1995, standard publishers, Delhi-111006
1. S. K. Garg **"Physical and Engineering Geology"** Third edition 1999- Khanna Publishers, Delhi-111006
2. K.V.G.K Gokhale, **"Principles of Engineering Geology" –** Revised edition 2005, B.S. Publication Hyderabad.
3. D.S. Arora, **"Geology for Engineers"-** Second edition 1982, Mahendra Capital Publishers, Chandigarh-160017.
4. D. Venkata reddy, **"Engineering Geology" – 2011 edition**, Vikas publishing House Pvt. Ltd New Delhi.7. P.K. Mukherjee **"A text book of Geology" -** The World Press Pvt. Ltd. Calcutta 700073.

5. Robert F Legget, **"Geology and Engineers"** – Third **edition** Mc Graw Hill International Edition, Civil Engineering series

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,
5. Create an engineering geology model

Model question paper - P15CV34
Applied Engineering Geology

Time: 3 hrs *Max. Marks: 100*

Note: *i) Answer **FIVE** full questions, selecting **ONE** full question from each Unit.*
ii) Assume suitable missing data if any.

Unit - I

1. a. What is Geology? Briefly explain its important branches 6
b. What is Seismology? Explain with a neat sketch the different parts of internal structure of the
Earth. Add a note on Seismic waves role in understanding the structure and composition of the earth. 14

2. What is mineralogy? Explain how the physical properties of minerals are useful in their identification in the field with mineral examples. 20

Unit - II

3 a. What are igneous rocks? Explain with sketches the concordent and discordent igneous intrusive bodi*e*s. 14

b. What is texture? Explain with sketches equigranular and inequigranular textures of igneous rocks. 6

4. Explain the following:
i) Epigene and Hypogene Geological Agents
ii) Preventive measures to Landslides.
iii) Soil Profile with a neat sketch
iv) Importance of weathering of rocks. 20

Unit - III

5. Explain the following with neat sketches:
i) Horst and Graben structure. ii) Compass clinometers and its uses
iii) A typical fold and its parts. iv) Angular unconformity and Disconformity 20

6. What is a DAM? With what purpose it will be constructed? Explain in detail the geological investigations of a good dam site. 20

Unit - IV

7 a. Write a note on hydrological cycle. 5
b. Explain in detail the vertical distribution of ground water. 10
c. Write a note on artificial recharge of ground water in rain water harvesting. 5

8 a. Explain briefly the causes and effects of Earthquakes. 10
b. Types of soil erosion and its preventive measures. 10

Unit - V

9 a. Classification of rocks based on aquifer characters 10
b. Impact of mining on Geo- Environment. 10

10 a. Geo-physical prospecting for ground water. 10
b. Application of remote sensing in Civil Engineering practice. 10

Course Title : Fluid Mechanics			
Course Code : P15CV35	**Semester :** III	**L - T - P :** 4 - 0 - 0	**Credits:** 4
Contact Period: Lecture: 52 Hrs, Exam:3 Hrs		**Weightage:** CIE:50%; SEE:50%	
Prerequisites : Engineering Physics			

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 fluidics 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.

Fluid properties and classification of fluids: Mass density, specific volume, specific weight, relative density, viscosity, Newton's law of viscosity (with units and dimensions) and problems, Newtonian and Non-Newtonian fluids, ideal and real fluids, compressibility, vapour pressure, surface tension, equation for stability of bubble and droplet of liquid, capillarity… theory and problems 10Hrs

Unit-2

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, mechanical pressure gauges.

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. 10 hrs

Unit-3

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, definition of velocity potential, stream function, equipotential line and flownets, relation between velocity potential and stream function, problem on continuity equation, problem on 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, application of Bernoulli's equation - venturimeter and pitot tube, momentum equation, problems. 12Hrs

Unit – 4

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 gradual closure and sudden closure of valve and problems. 10 Hrs

Unit-5

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, classification and equation for discharge over rectangular, triangular and trapezoidal notches and problems, Cippoletti notch, problems. Nappe - Types of Nappe and ventilation of weirs. Broad crested weir, problems, submerged weirs, equation for discharge, problems. 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, Dhanpat Rai 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.

Course Outcomes

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

1. Understand the concept of fluid, its relevance in civil engineering; differentiate between fluid and solids, fluid continuum
2. Classify the fluids based on physical properties, and compute various fluid properties.
3. Define the concept of pressure, pressure head, Pascal's law, and measurement of pressure using mechanical gauges and manometers
4. Understand the concept of total pressure, centre of pressure and its computation on a submerged horizontal, vertical and inclined plane surfaces and on the curved immersed surfaces, pressure diagrams
5. Compute head losses in pipe systems. Water hammer in pipes
6. Understand the concept of notches, weirs, classifications, ventilation of weirs. Measure the flow using notches and weirs.

Model question paper - P15CV35

Fluid Mechanics

Time: 3 hrs *Max. Marks: 100*

***Note** : i) Answer **FIVE** full questions, selecting **ONE** full question from each Unit.*
ii) Assume suitable missing data if any.

Unit - I

1. a. Define fluid. Bring out clearly the difference between a solid and a fluid. 6
b. What do you understand by the term fluid continum. Explain. 4
c. If 5m3 of oil weighs 45 kN, determine the specific mass, specific weight, specific gravity of oil. Also calculate kinematic viscosity of oil if viscosity is 20 poise. 10

2 a. Distinguish between,
i) Cohesion and adhesion.
ii) Dynamic viscosity and kinematic viscosity. 4
b. The velocity distribution for flow over a flat plate is given by $u = 0.75y – y2$ in which u is the velocity in meters per second at a distance y meters about the plate. Determine the Shear stress at y = 0.15 m. Take dynamic viscosity of fluid as 8.5 poise (0.85 Pa-s). 6
c. A capillary tube having on inside diameter of 4 mm is dipped in water at atmospheric temperature of 20ºC. Determine the height of water which will rise in the tube. Take surface tension of water as 0.075 N/mm and contact angle of 60º. What will be the percentage change in capillarity, if the tube diameter is reduced to half? 10

Unit - II

3 a. Differentiate between:
i) Gauge pressure and absolute pressure ii) Pressure and pressure head
iii) Piezometers and monometer iv) Single monometer and differential monometer. 8
b. Explain Bourdon tube pressure gauge with a neat sketch. 6
c. The left leg of a U – tube measuring monometer is connected to a pipe line conveying water.
The level of mercury in the leg being 0.6 m below the center of pipe line and the right leg is open to atmosphere. The level of mercury in the right leg is 0.45 m about that in the left leg and the space above mercury in the right leg contains benzene having a specific gravity of 0.88 to a height of 0.3 m. Find the pressure in the pipe. 6

4 a. Define; i) Center of pressure ii) Total pressure 4
b. Derive the formula for hydrostatic force and depth of center of pressure for an inclined plane surface submerged in a liquid. 8
c. Find the magnitude and direction of the resultant force due to water on a roller gate of cylindrical form of 5 m diameter. The gate is 10 m long placed on the dam in such a way that water is just going to spill. The axis of gate is parallel to the length of the gate. 8

Unit - III

5 a. Differentiate
i) Stream line and streak line ii) Path line and potential line
iii) Rotational and irrotational flow 6
b. Obtain an expression for continuity equation in three dimensional form. 8
c. The velocity potential function is given by □□= $5(x2 – y2)$ Calculate the velocity components at the point (4, 5). 6

6 a. Derive the Bernoulli’s energy equation from the Euler’s motion equation. Mentioning clearly the assumption made in the derivation. 8
b. Apply Bernoulli’s equation for Venturimeter and derive the discharge equation. 6

c. A submarine moves horizontally in sea and has its axis 15 m below the surface of water. A Pitot tube properly placed just in front of the submarine and along its axis is connected to the two limbs of a **u** – tube containing mercury. The difference of Hg level in found to be 170 mm. Find the speed of the submarine knowing that the specific gravity of Hg is 13.6 and that the sea water is 1.026 with respect of fresh water. 6

Unit - IV

7 a. Define Reynolds number and how do you use it to classify the flow in pipes. 4

b. Distinguish between:

i) Hydraulic gradient line and total energy line

ii) Pipes in series and pipes in parallel. 4

c. A pipeline of 0.6 m diameter is 1.5 km long. To increase the discharge, another line of the same diameter is introduced parallel to the first in the second half of the length. Neglecting minor losses. Find the increase in discharge if 4f = 0.04. The head at inlet is 300 mm.

12

8 a. Derive the Darcy' Weisbah equation for the loss of head due to friction for the flow through pipe. 6

b. What do you mean by water hammer? Derive an expression for sudden rise of pressure due to gradual closure of value.

6

c. Determine the difference in elevation between the water surfaces in the two tanks which are connected by a horizontal pipe of dia 30 cm and length 400 m. The rate of flow of water through the pipe is 300 LPS. Consider all losses and take the value of f = 0.02. Sketch the total energy line, showing the calculations at salient points. 8

Unit - V

9 a. Define the following theory and find out the relation among them;

i) Coefficient of velocity (Cv)

ii) Coefficient of contraction (Cc)

iii) Coefficient of discharge (Cd) 6

b. What is mouth piece? How are they classified? 4

c. In performing an experiment to determine different coefficients of a sharp edged orifice a jet of water issuing horizontally flow from the orifice 25 mm dia under a constant head of 150 cm fall through 0.9m vertically and struck the ground at 2.3 m horizontally from vena contracta. The time required to discharge 91 liters of water was found to be 53 seconds. Calculate all the hydraulic coefficients for the orifice.

10

10 a. What are the advantages of V Notch over rectangular Notch? Obtain an expression for the discharge through a V Notch. 6

b. What is ventilation of a weir? Why it is necessary? How it is provided? 6

c. A sharp crested rectangular notch is used to measure flow in a rectangular channel of 4 m width. The weir crest is 0.25 m above the bed of channel. If the depth of flow in the channel is 3 m, find the discharge neglecting velocity of approach. If the same discharge flow out a 90º triangular notch, what is the depth of flow above its crest? Assume Cd=0.62 for both notches. 8

Course Title : Basic Surveying			
Course Code : P15CV36	**Semester :** III	**L - T - P :** 4 - 0 - 0	**Credits:** 4
Contact Period: Lecture: 52 Hr, Exam:3 Hr		**Weightage:** CIE:50; SEE:50	

Prerequisites : Nil

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.88
4. Distinguish between types of leveling and to prepare data of leveling.
5. Understand characteristics of contours and methods of plain table surveying.

Relevance of course : Features of ground and its elevation w.r.t mean sea level is 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, booking of chain survey work, field book, entries, conventional symbols, obstacles in chain survey, numerical problems, errors in chain survey and precautions to be taken, measurement of distances over sloping grounds, chain and tape corrections - numerical problems. **10** Hrs

Unit-2

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 and numerical problems, dip and declination, local attraction, **Traverse Survey;**-closed and open traverse, checks for closed traverse and concept of latitude and departure, determination of closing error and its direction, Bowditch's graphical method of adjustment of closed traverse, Bowditch's rule and transit rule, omitted measurements (only length and corresponding bearing of one line.

10 Hrs

Unit-3

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, sensitiveness of bubble tube, curvature and refraction correction, types of levelling, 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, errors and precautions, Numerical problems. **10** Hrs

Unit-4

Contouring : Contours and their characteristics, methods of contouring, direct and indirect methods, interpolation techniques, uses of contours, 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.

Minor instruments: EDM Devices, Brief uses of instruments such as planimeter, digital planimeter hand level, Ceylon ghat tracer, Abney level, Sextant. **12Hrs**

Unit – 5

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, prolonging a straight line by a theodolite in adjustment and theodolite not in adjustment.

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, 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. Schimidt - 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

Course Outcomes

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

1. Define surveying, Classify & Indentify basic principles of surveying.
2. Compute the distance over sloping ground using chain and tape
3. Conduct compass traversing.
4. Apply the Knowledge of leveling & its importance in civil engineering.
5. Understand the concept of plane table surveying.
6. Use trapezoidal and prismoidal formulae to find area and volumes.
7. Solve numerical problems

Model question paper - P15CV34
Basic Surveying

Time: 3 hrs *Max. Marks: 100*

Note: *i) Answer **FIVE** full questions, selecting **ONE** full question from each Unit.*
ii) Assume suitable missing data if any. .

Unit - I

1 a. Explain the Basic principles of surveying. 8
b. What is ranging of a survey time? Explain the method of indirect or reciprocal ranging with a neat sketch. 6
c. List the different types of chains and tapes used in chain surveying. 6

2 a. Write a note on classification of survey. 6
b. Write a short note on EDM device with principle. 6
c. A line was an measured with a steel tape which was exactly 30mt at 18ºC and a pull of 50 N and the measured length was 459.24 m. Temperature during measurement was 28ºC and the pull applied was 100 N.The tape was uniformly supported during the measurement. Find the true length of the line if the cross – sectional area of the tape was 0.02 cm2, The coefficient expansion /ºC = 0.0000117 and the modules of elasticity = 21x106 N/cm2 8

UNIT - II

3 a. What are the conditions to be fulfilled by survey lines and survey stations? 6
b. With the conventional symbols for the following cultivated land. Buildings, waterfalls, tunnels, bridge, dam, electrical and telephone line. 8
c. Define Baseline, check line and tie line. 6

4 a. Explain how will you continue chaining past the following obstacles:
i) Pond ii) River iii) Building. 6
b. There is an obstacle in the form of a pond on the main chain line AB. The points C and D were taken on the opposite sides of the pond. On the left of CD, the line CE was laid out 100 m in length and a second line, CF, 80 m long was laid out on the right of CD such that E, D and F are in the same st line. ED and DF were measured and found to be 60 m and 56 m respectively. Find out the obstructed length CD. 8
c. The following perpendicular offsets were taken at 10 m intervals from a survey line to anirregular boundary line. 3.25, 5.60, 4.20, 6.65, 8.75, 6.20, 3.25, 4.20, 5.65 calculate the area enclosed between the survey line, the irregular boundary line, and the first and last offsets, by the application of
i) Trupezoidal rule ii) Simpsons rule. 6

UNIT - III

5 a. Distinguish between: i) Magnetic meridian and true meridian ii) WCB and QB
iii) Isogonic and Agonic lines iv) closed and open transverse 10
b. The following bearings were observed with a primitive compass. Calculate the interior angles apply check. Line AB BC CD DE EA Fore Bearing 60º30□□122º0□□46º0□□205º30□□300º0□
10

6 a. Explain the fundamental parts and Axis of transit the odolite.
i) Back sight ii) Fore sight iii) Reduced level iv) change point v) Bench mark 10
b. Explain measurement of horizontal angle by repetition and reiteration method. 10

UNIT - IV

7 a. Explain the following terms with respect to leveling:
i) Back sight ii) Fore sight iii) Reduced level iv) change point v) Bench mark 10

b.The following readings are observed successively with a leveling instrument. The instrument was shifted after 5th and 11th readings. 0.585, 1.010, 1.735, 3.295, 3.765, 0.350, 1.300, 1.795, 2.575, 3.375, 3.895, 1.735, 0.635 and 1.605. Rule out a page of level book and determine the RL of various points, if RL of the first point is 136.440 m using rise and fall method. 10

8 a. Explain the temporary adjustments of a dumpy level. 8

b. Following readings are taken with a dumpy level and 4mt leveling staff on a continuously sloping ground at 30mt intervals. 0.680 ,1.455, 1.855, 2.330, 2.330, 2.885, 3.380, 1.055, 1.860, 2.265, 3.540 , 0.835, 0.945,1.530 and 2.250 Enter the above readings in a level book. Determine the gradient between the first and last point and apply usual check. 12

UNIT - V

9 a. Define contour and explain the various characteristics of contour with neat sketches. 10

b. Discuss in detail methods of direct and indirect contouring and briefly explain interpolation technique. 10

10a. State the advantages and disadvantages of plane table surveying. 10

b. State three-point problem and explain with neat sketches how it is solved by graphical method. 10

Course Title : Basic Surveying Practice			
Course Code : P15CVL37	**Semester** : III	**L - T - P :** 0 - 0 – 3	**Credits**: 4
Contact Period: Lecture: 39 Hrs, Exam: 3 Hrs	**Weightage:** CIE:50; SEE:50		

Prerequisites : Basic Surveying

Relevance of course : practicing surveying and leveling

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 Auto level by plane of collimation method and rise & fall method.
Exercise -8: L-Section and cross section of the road, water supply and sewage line (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, measurement of vertical angles using theodolite.

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. Schimidt - Wong, Thomson Learning.
6. Surveying Vol. I, S.K. Duggal

Course outcomes
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 Title : Basic Material Testng Lab			
Course Code : P15CV38	**Semester :** III	**L - T - P :** 0 - 0 - 3	**Credits :** 1.5
Contact Period: Lecture: 39 Hr,Exam:3 Hr		**Weightage:** CIE:50; SEE:50	
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

3. Tension test on mild steel and HYSD bars.
4. Compression test of mild steel, cast iron and wood.
5. Bending test on wood under two point loading.
6. Shear test on mild steel.
7. Impact test on mild steel (Charpy and Izod)
8. Hardness tests on ferrous and non-ferrous metals - Brinell's, Rockwell and Vickers tests.
9. Test on bricks and tiles
10. Tests on fine aggregates - moisture content, specific gravity, bulk density, sieve analysis and bulking.
11. Tests on coarse aggregates - absorption, moisture content, specific gravity, bulk density and sieve analysis.
12. 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,
3. Steel.
4. Evaluate physical properties of fine and coarse aggregates.
5. Compute the material hardness
6. Evaluate the charpy and Izod impact strengths.

Course Title: Aptitude and Reasoning Development - BEGINNER. (ARDB)			
Course Code : P15HU39	**Semester :** III	**L - T - P :** 0 - 0 - 2	**Credits:** NA
Contact Period: Lecture: 32 Hrs, Exam: 3 Hrs		**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. Analyse 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

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

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. **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. **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.

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. **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. **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

Course Title : Additional Mathematics-I (A Bridge course for Diploma qualified students of III Sem. B. E.)			
Course Code : P15MADIP31	**Semester :** III	**L :T:P:H :** 2:2:0:4	**Credits:** NA
Contact Period: Lecture: 52 Hrs,		**Weightage: CIE:**100%, [P/NP]	

Course contents

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^{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* $sin^m x cos^m x$ 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^{nd} Ed. 2012.

References:

1.E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 6^{th} Ed., 2007.
2.N.P.Bali and Manish Goyal: Engineering Mathematics, Laxmi Publishers, 7^{th} Ed., 2007.

Course Title: Indian Constitution, Human Rights and Professional Ethics (A course for Diploma qualified students of III Sem. B. E.)			
Course Code: P15HMDIP310	**Semester :** III	**L-T-P-H:** 2–0-0-0-2	**Credits:** NA
Contact Period : Lecture :26 Hr		**Weightage :** CIE:100% - [P/NP]	

COURSE CONTENT

I. Indian Constitution:

1. Introductory Part - The preamble, Fundamental rights
2. Directive principles of state policy - and fundamental duties
3. The union executive, union legislature and the union judiciary
4. The state executive, state legislature and the high court in the states
5. Special provision for scheduled caste and scheduled tribes
6. Election commission - Functions - Emergency provisions and amendment of the constitution

II. Human rights:

Aims and objectives to create responsible citizenship with awareness of human rights and latest development.

1. Protection of human rights and protection of human rights act - 1993
2. Human right - with related to rights of women, children disabled, tribal's, aged and minorities

III. Professional Ethics:

1. Aims, objects - advantages with national and international, recent development.

4th SEMESTER

Course Title: Engineering Mathematics-IV (Common to AU, CV, ME and IP&E Branches)		
Course Code: P15MAAC41	**Semester: 4**	L – T – P – H : 3– 2 – 0 – 5
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.	**Weightage: CIE: 50%; SEE: 50%**	

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

Course Learning Objectives (CLOs):

This Course aims to;

1. Understand the basics of functions of complex variables, analytic functions, conformal and bilinear transformations, complex integration, line/surface/volume integrals and residue theorems with their scientific/engineering importance
2. Solve algebraic, transcendental and ordinary differential equations arising in various engineering flow and design data problems, using numerical techniques along with physical interpretation of the solutions associated with initial/boundary conditions.
3. Apply the basic tools of statistics to understand curve fitting, moments, skewness, kurtosis, correlation and regression, for frequency distributions; explore the idea of probability, probability distributions, required in the analysis of engineering experiments
4. Apply the basic concepts of probability distributions to understand concept of joint probability and to find expectation covariance, correlation coefficient etc. and to understand probability vector, stochastic matrix etc.
   Understand iterative methods in linear algebra such as Gauss-Jacobi, Gauss -Seidel, Relaxation and Power method and their practical utility in engineering fields.
5. Explain functional and extremal of functionals Euler's equation and applications of calculus of variations to the standard variational problems and basic concepts of reliability theory including failure laws required in the analysis of engineering experiments occurring in engineering fields.
   Obtain series solution of essential ODE's such as Bessel's and Legendre's differential equations and understand their scientific/engineering utility

Relevance of the Course:

Engineering Mathematics-IV deals with Complex analysis. Here we understand the basics of complex variable, analyticity and potential fields through complex potential and conformal transformations interpret the solution in fluid flow and electromagnetic problems.

The process of complex integration and series representation of functions of complex variables in field theory and other Engineering applications.

Solving algebraic, transcendental and ordinary differential equations arising in various engineering flow and design data problems.

In Statistics interpretation and analyzing the data, fitting of curves of best fit for experimental data arising in engineering calculations and analyze the same by expressing in the form of regression lines.

Probability distributions and use them in analyzing and solving engineering problems associated with probability models

Variational problems used in structural engineering, aerospace, ground water flows and environmental fluid dynamics, etc

Understand series solution of ODE's and special functions in engineering fields.

Course Content

UNIT-I

Complex Analysis: Introduction to functions of complex variables. Definitions- limit, continuity and differentiability. Analytic functions. Cauchy–Riemann equations in cartesian and polar forms, 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 = $z+1/z\,(z\neq 0)$ .Bilinear transformations.

Complex integration: complex line integrals. Cauchy's theorem, Cauchy's integral formula. Taylor's and Laurent's series (Statements only). Singularities, poles and residues. Cauchy's residue theorem (statement only). Simple illustrative examples. **11 Hrs**

UNIT-II

Numerical Methods-II: Solution of algebraic and transcendental equations : Bisection Method, Regula-Falsi, Newton–Raphson,Fixed point iteration method: Aitken's Δ^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. Euler's and modified Euler's method. Runge - Kutta method of IV order –Milne's and Adams predictor and corrector methods (All formulae without proof). **10 Hrs**

UNIT-III

Statistics: Brief review of measures of central tendency and dispersion. Moments, skewness and kurtosis. Curve fitting – least square method

$y = a + bx; y = ax^b, y = ab^x \text{ and } y = ax^2 + bx + c$.

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 for all distributions) - Illustrative examples from engineering and industrial fields. **11 Hrs**

UNIT-IV

Joint probability distributions and Markov chains:

Concept of joint probability. Joint probability distributions of discrete random variables. Expectation, covariance, correlation coefficient – simple examples. Probability vectors, stochastic matrices. Fixed point and regular stochastic matrices.

Linear Algebra-II: Numerical methods for system of linear equations- Gauss-Jacobi and Gauss-Seidel iterative methods. Relaxation method**.** Determination of largest eigen value and corresponding eigen vector by power method. **10 Hrs**

UNIT-V

Calculus of Variations: Variation of a function and a functional, extremal of a functional. Variational problems – Euler's equation. Applications to standard variational problems including geodesics, minimal surface of revolution, hanging chain and brachistochrone problems.

Series solutions of ODE's and special functions: Series solution-Frobenius method. Series solution leading to $J_n(x)$ - Bessel's function of first kind. Expansions for $J_{1/2}(x) \text{ and } J_{-1/2}(x)$. -simple related examples. Series solutions of Legendre's differential equation leading to $P_n(x)$ -Legendre's polynomials. Rodrigue's formula(No Proof)- simple illustrative examples. **10 Hrs**

Text Books:

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

References:

1. Probability – Seymour Lipschutz, Schaum's outline series, McGraw-Hill publications, **2nd Edition, 2002.**
2. **Introductory Methods of Numerical Analysis: - S.S.Sastry, PHI, 3rd Ed.2000**.
3. Advanced Modern Engineering Mathematics:- Glyn James, Pearson Education Ltd., **3rd Edition, 2011.**

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.

Course Outcomes

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

1. 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.
2. 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.
3. 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 models
4. 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.
   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.
5. Explain functional and extremal of functionals Euler's equation and applications of calculus of variations to the standard variational problems and basic concepts of reliability theory including failure laws required in the analysis of engineering experiments occurring in engineering fields.
   Obtain series solution of essential ODE's such as Bessel's and Legendre's differential equations and understand their scientific/engineering utility

Engineering Mathematics-IV(P15MAAC41)			
Time- 3Hrs	**Max. Marks- 100**		
Note: Answer any FIVE full questions choosing at least one full question from each unit			
Model Question Paper	Marks	CO's	Levels
UNIT- I			
1 a) If $\phi + i\psi$ represents the complex potential of an electrostatic field where $\psi = (x^2 - y^2) + \frac{x}{x^2 + y^2}$, find ϕ and also the complex potential as a function of the complex variable z.	6	1	L2
b) Discuss the transformation $w = z + 1/z$, $z \neq 0$.	7	1	L3
c) Find the bilinear transformation which maps the points $z = \infty, i, 0$ into $w = -1, -i, 1$. Also find the invariant points of the transformation.	7	1	L3
2 (a) Evaluate $\int_0^{2+i} (\bar{z})^2 dz$ along (i) the line $x = 2y$ (ii) the real axis up to 2 and then vertically to $2+i$.	6	1	L2
b) Expand $f(z) = \frac{z+1}{(z+2)(z+3)}$ as Laurent's series in the regions (*i*) $\lvert z \rvert > 3$ *and* (*ii*) $2 < \lvert z \rvert < 3$.	7	1	L3
c) Evaluate $\int_C \frac{e^{2z}}{(z+1)^2(z-2)} dz$ where C is the circle $\lvert z \rvert = 3$ by Cauchy residu theorem.	7	1	L3

UNIT- II			
3. a) Using Regula–Falsi method find the approximate root of the equation $x log_{10} x = 1.2$ (perform three iterations)	6	2	L2
b) Use Newton – Raphson method to find a real root of $x \sin x + \cos x = 0$ near $x = \pi$. Carry out the iterations upto four decimal places of accuracy.	7	2	L2
c) Find the smallest root of the equation $x^2 + 2x - 2 = 0$, using fixed point iteration method and accelerate the convergence by Aitken's $\Delta^2 -$ method.	7	2	L2
4. (a).From Taylor's series method, find $y(0.1)$ considering upto fourth degree term if $y(x)$ satisfies the equation $\frac{dy}{dx} = x - y^2, y(0) = 1$	6	2	L2
b). Using modified Euler's method find y at $x = 0.2$ given $\frac{dy}{dx} = 3x + \frac{1}{2}y$ with $y(0) = 1$ taking $h = 0.1$. Perform three iterations at each step	7	2	L3
c). Apply Milne's method to compute $y(1.4)$ correct to four decimal places given $\frac{dy}{dx} = x^2 + \frac{y}{2}$ and the data: $y(1) = 2$, $y(1.1) = 2.2156$, $y(1.2) = 2.4649$, $y(1.3) = 2.7514$	7	2	L2

UNIT- III

5. a) The first four moments about an arbitrary value 5 of a frequency distribution are -4, 22, -117 and 560. Find the skewness and kurtosis based on moments. | 6 | 3 | L1

b) Fit a best fitting parabola $y = a + bx + cx^2$, by the method of least squares for the data: | 7 | 3 | L2

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

c) The following data gives the age of husband (x) and the age of wife (y) in years. Find the correlation coefficient and hence obtain the regression lines. Also calculate the age of husband corresponding to wife of 16 years age : | 7 | 3 | L2

x	36	23	27	28	28	29	30	31	33	35
y	29	18	20	22	27	21	29	27	29	28

6. a) Find the value of k such that the following distribution represents a finite probability Distribution: | 6 | 3 | L2

x	-3	-2	-1	0	1	2	3
$p(x)$	k	$2k$	$3k$	$4k$	$3k$	$2k$	k

Also, find $P(x \le 1), P(x > 1)$ *and* $P(-1 < x \le 2)$

b) The number of telephone lines at an instant of time is a binomial variate with probability 0.1 that a line is busy. If 10 lines are chosen at random , what is the probability that (i) no line is busy (ii)all lines are busy (iii)at least one line is busy (iv)almost 2 lines are busy | 7 | 3 | L2

c) State probability density function of Gaussian (normal) distribution. An analog signal received at a detector (measured in micro-volts) may be modeled as a Gaussian random variable with mean 200 and variance 256 at a fixed point of time. What is the probability that the signal will exceed 240 micro-volts? | 7 | 3 | L3

UNIT- IV

7. a) random variable of X and Y having the following joint distribution | 6 | 4 | L2

X \ Y	-3	2	4
1	0.1	0.2	0.2
2	0.3	0.1	0.1

Find (i) Marginal distributions of X and Y (ii)Cov (X,Y)
(iii) Are the variables X, Y statically independent?

b) Define (i) stochastic matrix (ii) regular stochastic matrix. Find the unique probability vector for the regular stochastic matrix $\begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$ | 7 | 4 | L3

c) Verify that $f(x,y) = \begin{cases} e^{-(x+y)}, & x \ge 0,\ y \ge 0 \\ 0, & otherwise \end{cases}$ is a probability density function of two - dimensional probability function.Evaluate $P(x<1), P(x \le y)$ and $P(1/2 < x < 2,\ 0 < y < 4)$ | 7 | 4 | L2

8 a) Solve the system of the equations by Gauss –Seidel method (Perform 3 iterations)
$x + y + 54z = 110, \quad 27x + 6y - z = 85, \quad 6x + 15y + 2z = 72$. | 6 | 4 | L2

b) Solve the system: $2x_1 + 8x_2 - x_3 = 24; 12x_1 + x_2 + x_3 = 31; 3x_1 + 4x_2 + 10x_3 = 58$,
by relaxation method | 7 | 4 | L2

c) Find the dominant eigen value and the corresponding eigen vector of $A=\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ by Power method taking the initial eigen vector as $[1,1,1]^T$	7	4	L3

UNIT- V			
9. a) Find the extremals of the functional. $\int_{x_1}^{x_2}(y^2+y'^2+2ye^x)dx$	6	5	L2
b) Solve the variational problem $\int_0^{\frac{\pi}{2}}(y^2-y'^2)dx=0;\ y(0)=0,\ y\left(\frac{\pi}{2}\right)=2$	7	5	L2
c) Prove that Catenary is the curve which when rotated about a line generates a surface of minimum area.	7	5	L2
10. a) Develop a series solution of the equation $(1+x^2)y''+xy'-y=0$.	6	5	L2
b) Solve the Bessel's differential equation $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^2-n^2)y=0$.	7	5	L3
c) Express $4x^3-2x^2-3x+8$ in terms of Legendre's polynomials.	7	5	L3

Course Title : Concrete Technology			
Course Code : P15CV42	**Semester :** IV	**L - T - P :** 4 - 0 - 0	**Credits:** 4
Contact Period: Lecture: 52 Hrs, Exam: 3Hrs		**Weightage:** CIE:50; SEE:50	

Prerequisites : Nil

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
5. Describe chemical admixtures and mineral admixtures.
6. Explain hardened concrete and its strength properties.
7. Summarize curing, factors affecting creep and shrinkage.
8. To imbibe the culture of professional and ethical responsibilities by following codal provisions in concrete mix design for strength and durability.
9. Demonstrate tests on hardened concrete.
10. To be able to create a particular type of concrete of specific purpose
11. To have the knowledge of advanced concrete technology.

Relevance of course: concrete is a material for construction

Unit – I

CONCRETE INGREDIENTS AND MICROSTRUCTURE: Cement – Chemical composition, hydration of cement, types of cement, manufacture of OPC with flow charts. Bogue's compound, transition zone in cement paste, 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), Structure of aggregate phase, structure of hydrated cement paste, structure - property relationship in hydrated cement paste. Manufactured sand its significance and differences**.** 12Hrs

Unit-2

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 and air entraining agents. Mineral admixtures – fly ash, blast furnace slag, meta-kaolin, Silica fume, rice husk ash. 10Hrs

Unit – 3

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, Poisson ratio, the relationship between these parameters. Accelerated curing, aggregate-cement bond strength. Shrinkage – plastic shrinkage and drying shrinkage, factors affecting shrinkage. Creep – measurement of creep,

factors affecting creep, effect of creep. Hot weather concreting. Tests on hardened concrete – compressive strength, split tensile strength, flexural strength, non-destructive testing of concrete. (Detailed test procedures to be covered in laboratory). 10Hrs

Unit – 4

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. Introduction to current American (ACI) and British (BS) provision in revised IS code 10262- 2009, numerical examples of mix design. 12Hrs

Durability of concrete-introduction, permeability of concrete, chemical 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. 12Hrs

Unit-5

Progress in concrete Technology: properties and uses of High strength Concrete, Self-compacting concrete, Polymer impregnated concrete, High performance concrete and Roller compacted concrete, Porous concrete, Bacterial concrete, translucent concrete, Engineered cementations composites and smart concrete. 10Hrs

Text Book:

1. Shetty MS, Concrete technology, Chand S and Co.
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.

Course Outcomes

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

1. Apply basic knowledge to evaluate concrete properties.
2. Distinguish between coarse aggregate& fine aggregate and their properties.
3. Understand the workability and durability of concrete.
4. Discuss chemical admixtures and mineral admixtures.
5. Apply mix design concepts.

Model question paper - P15CV42
Concrete Technology

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each **Unit**.*
ii) Assume suitable missing data if any. iii) Use of thermodynamic data hand book is permitted.

UNIT - I

1. a. Explain the manufacture of Portland Pozzolona Cement with flow chart. 10
b. Explain in brief the different types of Cement and their uses. 10

2 a. Explain Blaine's air permeability test for fineness of Cement. 10
b. Write the importance of size, and shape of coarse aggregate in concreting. 10

UNIT - II

3 a. Define Workability and Explain the factors affecting Workability. 10
b. Explain Slump Test for manufacturing workability. 10

4 a. Explain compaction factor test for measuring workability. 10
b. What is curing of concrete and also explain the methods of curing. 10

UNIT - III

5 a. Explain gel / space ratio and Maturity concept. 10
b. Write a note on Accelerated Curing Test and Aggregate Cement bond strength. 10

6. a. Explain Plastic Shrinkage and drying shrinkage. 10
b. Explain the factors affecting creep of concrete. 10

UNIT - IV

7 a. What is the Concept of Mix Design and also explain the factors affecting Mix Design. 12
b. Write a note on four variables in concrete mix design. 8

8 Design of Concrete mix by I.S code method (10262 - 2009) of M25 grade concrete given specific gravity of coarse aggregate, fine aggregate and cement are 3.15, 2.6 and 2.6 respectively and water absorption of coarse aggregate is 0.5% and fine aggregate is 1.0%. 20

UNIT - V

9 a. Write a note on durability and permeability of concrete. 10
b. Write a note on Sulphate attack and construction Joints in concrete. 10

10 a. Explain control of Cracking in mass concrete and repairs of cracks. 10
b. Explain split tensile strength of hardened concrete. 10

Course Title : Basic Structural Analysis			
Course Code : P15CV43	**Semester :** IV	**L - T - P :** 4 - 0 - 0	**Credits:** 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage:** CIE:50; SEE:50	

Prerequisites :Strength of Materials

Course Learning Objectives (CLOs)

This course aims to

1. Identify structural form, idealization, stability and determinacy.
2. Define common problems of trusses.
3. Determine deflection by different methods.
4. Use necessary laws to find deformations in beams, frames and trusses.
5. Analyse thrust, shear and bending moment in cable structures and three hinged arches.
6. Use of influence lines for distributed loads and rolling loads.
7. Analyse statically indeterminate beams using consistent deformation method.
8. Solve numerical problems.
9. Analyse statically indeterminate structures using strain energy method.
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 dimensional structures, surface structures, idealization of structures, transmission of forces, Principle of superposition. Conditions of equilibrium, degree of freedom, static and kinematic indeterminacy in structures. Solve problems.

Plane trusses: Introduction, assumptions, common patterns of trusses, methods of analysis of simple plane trusses - Method of joints and methods of sections-Solved problems. Deflection in beams-introduction- Moment area method- Solved problems

Elastic stability of columns: Introduction, short and long columns, Euler's theory on columns, effective length, slenderness ratio, raiuds of gyration and buckling load, assumtions, derivations of euler;s buckling load for different end conditions, limitations of euler's theory and problems, Rankine's formula and problems 10 Hrs

Unit-2

Deflection: Conjugate beam method- Solved problems. Moment area method-Solved problems.

Energy concepts-Introduction, complementary energy or work, forms of elastic strain energy (internal work), real work and virtual work, Betti's law and Maxwell's law, Castigliano's theorem, unit load method.(No numerical problems) 10 Hrs

Unit-3

Cable structures: Introduction, analysis of cable subjected to concentrated loads, uniformly distributed vertical loads, length of cable, cable passing over pulley and saddle. **Three hinged arches**: Circular and parabolic arches with supports at same levels and different levels, determination of thrust, shear and bending moment. Introduction. 10 Hrs

Unit – 4

Rolling loads and influence lines for SSB and continuous beam, Influence lines for reactions, shear force, bending moments in simply supported beam. 10 Hrs

Unit-5

Analysis of statically indeterminate structures by strain energy method (with static indeterminacy≤ 3) :Introduction - Strain energy method, analysis of propped cantilever and fixed beams, continuous beams. Solved problems.

Analysis of statically indeterminate structures by three moment equation. (with static indeterminacy ≤3) : Introduction - Analysis of continuous beam using Clapeyoran's theorem of three moments, settlement of supports. Solved problems. 12 Hrs

Text Book:

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

Course Outcomes

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

1. Identify structural forms, idealization, stability and determinacy.
2. Define common problems of trusses
3. Determine deflection by different methods
4. Use influence lines for distributed loads and rolling loads
5. Solve numerical problems

Model question paper - P15CV43
Basic structural analysis

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each **Unit**.*
ii) Assume suitable missing data if any.

UNIT - I

1. a. Determine the degree of static indeterminacy for the structures shown in Fig. Q1(a) 4

b. Determine the degree of Kinematic indeterminacy for the structures shown in Fig. Q1(b) assume the members as inextensible. 4

c. Find the forces in the members of the pin-jointed plane truss shown in Fig. Q1(c). Use method of joints. 12

2 a. Find the maximum slope and maximum deflection in the cantilever beam shown in Fig. Q2(a). Use Moment Area method. Take; EI = 30,000 kN-m2. 10

b. Find forces in members DE, DG and FG in the pin jointed plane truss shown on Fig. Q2(b). Members AC, CD, DE and EB are of equal length. Use method of sections. 10

UNIT - II

3 a. What is a Conjugate beam? Tabulate the relation between the various types of real support and conjugate support. 8

b. Find the maximum slope and maximum deflection in the simple supported beam shown in Fig. Q3(b) Take; E = 200 GPa and I = 8x107 mm4. 12

4 a. State and explain Castigliano's strain energy theorem. 5

b. Find the maximum deflection and maximum slope in the cantilever beam shown in Fig. Q4(b). Use strain energy method. 15

UNIT - III

5 a. A Cable of uniform cross section is suspended between two supports which are 100 m apart. The supports are at the same level. The cable carries a concentrated load of 50 kN at 60 m from left support. The maximum Sag in the cable is 8 m. Find tension in the various portions of the cable. Also find the total length of the cable. 8

b. A three hinged parabolic arch having hinges at supports and crown has a span of 40 m and a central rise of 6 m. It carries an UDL of 20 kN/m over the left half span. It also carries a concentrated load of 50 kN at 10 m from left support. Find Bending Moment, Normal Thrust and Radial shear at 10 m from left support. 12

6. a. A simply supported beam of span 10 m carries loads as shown in Fig. Q6(a). Find;
(i) Bending Moment at 3 m from left support and
(ii) Shear force at 3 m from right support. Use Influence Line Diagrams. 6

b. Two Wheel loads of 120 kN and 80 kN spaced at 3 m crosses a simply supported beam of span 16 m from left to right with 120 kN load leading. Find;
(i) Maximum shear force developed at 6 m from left support,
(ii) Maximum bending moment developed under 80 kN load and
(iii) Absolute maximum bending moment developed in the beam. 14

UNIT - IV

7. Analyzed the propped cantilever beam shown in Fig. Q7 by consistent deformation method.
Support B sinks by 10 mm. Assume EI = 30,000 kN-m2. Sketch BMD, elastic curve and SFD. 20

8. Determine the fixed end moments in the beam shown in Fig. Q8 by consistent deformation method. Sketch the BMD. 20

UNIT - V

9 a. Analyze the propped Cantilever beam shown in Fig. Q9(a) by strain energy method. Sketch the BMD and elastic Curve. 10

b. A fixed beam of span 5 m carries an UDL of 20 kN/m over the entire span. Find the reactions at the supports. Use strain energy method. 10

10. Analyse the continuous beam shown in Fig. Q10 by three moments theorem. Supports B and C sink by 3 mm and 2 mm respectively. Assume EI = 27,000 kN-m2. Sketch BMD elastic curve and SFD. 20

Course Title : APPLIED SURVEYING			
Course Code : P15CV44	**Semester :** IV	**L - T - P :** 4 - 0 - 0	**Credits:** 4
Contact Period: Lecture: 52 Hr, Exam: 3Hr		**Weightage:** CIE:50; SEE:50	

Prerequisites : Basic Surveying

Course Learning Objectives (CLOs)

This course aims to

1. Compute elevation of objects when the base is accessible and inaccessible.
2. Predict the difference in elevation using trigonometric levelling.
3. Illustrate tacheometric surveying and its uses.
4. Using different methods of tacheometric surveying.
5. Construct simple curves using Rankine's deflection angle method.
6. Design of compound curves and reverse curves.
7. Develop transition curve.
8. Compute vertical curves.
9. Understand Geographic information system.
10. 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 tacheometric survey, tacheometric 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, moving hair method and tangential method, subtense bar. **10** Hrs

Unit-2

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 Rankines deflection angle method, two theodolite 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. **10** Hrs

Unit-3

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 Lemniscate, Numerical problems

Vertical Curves : Types of vertical curves, length of vertical curves, computation and setting out of a vertical curve, sight distance. Numerical problems. **12 Hrs**

Unit – 4

Total Station Instrument: Introduction, basic concepts, measurement of distance using phase difference, components of total station, adjustments, uses of total station, errors, accuracy, effect of atmospheric conditions advantages , limitations.

Remote sensing: Introduction, components and working principle and area of application. Advantages and disadvantages, types of remote sensing, different types of platforms, sensor & types, Electromagnetic radiation, Electro magnetic spectrum, atmospheric windows, spectral signature.

Unit – 5

Global Positioning Systems: Global positioning systems, segments of GPS, working principle, Hand held GPS and differential GPS, methods of GPS surveying, errors and accuracy, applications of GPS. . Advantages and disadvantages

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, GIS Data and data types.

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. Schimidt - Wong, Thomson Learning.
3. Fundamentals of Surveying - S.K. Roy - Prentice Hall of India.
4. Surveying, Arther Bannister et al., Pearson Education, India.

Course Outcomes

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

Understand trigonometric levelling in surveying.

1. Understand basic principles of tacheometric surveying.
2. Understand importance of different curves and set out of curves.
3. Apply basic knowledge to handle advanced surveying instruments .
4. Recognize total station instrument.
5. Describe working principle of GPS.
6. Understand Geographic information system

Model question paper -P15CV44
Applied Surveying

Time: 3 hrs *Max. Marks: 100*

***Note**: i)* Answer **FIVE** full questions, selecting **ONE** full question from each **Unit**.
ii) Assume suitable missing data if any.

UNIT - I

1. a. Briefly explain transit rule and Bowditch's graphical method of adjustment of traverse. 6
b. What are the omitted measurements? How are they calculated? 6
c. The following bearings were obtained for a closed traverse ABCDEA. Calculate the interior angles and apply the necessary check. Line AB BC CD DE EA Fane Bearing 60□30□□122□0□□46□0□□205□30□□300□0□

8

2 a. What is Local Attraction? How it is detected and eliminated. 6
b. The following fore and back bearings were observed in traversing with a compass in a place where local attraction was suspected. Line Fore Bearing Back Bearing
AB 38□30□□219□15□
BC 100□45□□278□30□
CD 25□45□□207□15□
DE 325□15□□145□15□
Find the correlated Fore bearing, Back bearing and the Fore bearing of each of the lines given that the magnetic declaration was 10□□W

14

UNIT - II

3 a. Derive the expression for the horizontal distance, vertical distance and the elevation of an elevated object by double plane method.

8

b. To determine the elevation of the top of the flag staff , the following observations were made
Instrument Station Reading on BM Angle of Elevation Remarks
A 1.266 10□28□□RL of BM
B 1.222 7□12□□= 248.362 m
Stations 'A' and 'B' and the top of the aerial pole are in the same vertical plane. Find the Elevation of the top of flag staff, if the distance between 'A' and 'B' is 50 m.

12

4 a. Derive the expressions for distance and Elevation of foot of the staff, when the staff is held vertical and the line of sight is in inclined upward.

10

b. Determine the gradient frame a point 'A' to a point 'B' from the following observations made with a tachometer filled with an Analytic lens. The constant of the instrument was 100 and the staff was held vertically. Instrument
Station Staff Point Bearing Vertical Angle Staff Readings P
A 1340 +10032□□1.360 1.915 2.470
B 2240 +506□□1.065 1.885 2.705

10

UNIT - III

5 a. Derive the expression for ordinates fraus long chord and Radial offsets. 8
b. Two tangents inter feet at a chain age of 1200 m and the deflection angle being 40□. Calculates the data necessary required to setout a simple curve by Rankines method. The degree of curve is 10□□and 20 m chain is used

12

6. a. With a neat sketch, Explain the various elements by a compound curve. Derive the relations by calculating the chain ages of tangent points.

10

b. A Compound curve consisting of two simple circular curves of radii, 350 m and 500 m is to
be laid out between two straights T1I and IT2. PQ is the common tangent, at the point of compound curvature, D. The angles IPQ and IQP are respectively 550 and 25□. Sketch and calculates the tangent lengths T1I and IT2.

10

UNIT - IV

7a. What are the segments of GPS? Describe term briefly. 10

b. Describe sources of Error in GPS. What is meant by selective availability? 10

8a. Define GIS, and its components, flow diagram of working of GIS. 10

b. Define remote sensing. Explain the working principle and area application. 10

UNIT - V

9a. What are the advantages and disadvantages of total station and explain its components. 10

b. Explain the measurement of distance using phase difference in total station. 10

10a. Explain the basic concept of terrestrial photogrammetry and areal photogrammetry. 10

b. Explain types of photographs and geometry of areal photographs. 10

Course Title : Hydraulics & Hydraulic Machines			
Course Code : P15CV45	**Semester : IV**	**L - T - P : 4 - 0 - 0**	**Credits: 4**
Contact Period: Lecture: 52 Hr, Exam: 3Hr		**Weightage: CIE:50; SEE:50**	

Prerequisites : Fluid Mechanics

Course Learning Objectives (CLOs)

This course aims to

1. Differentiate open channel flow and pipe flow, classify open channels, classifying open channel flow (laminar or turbulent, steady or unsteady, uniform or non-uniform, and critical, subcritical or supercritical), and compute the discharge in different types channel sections, design most economical channel sections.
2. Find critical depth and critical velocity in open channels, to tell the condition for critical flow, know about hydraulic jump and its uses, and compute depth of hydraulic jump and loss of energy due to hydraulic jump in open channels. Use the gauging flumes 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. Find the 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 the performance of different turbines under different conditions
7. Distinguish a pump from a turbine, know working of centrifugal pumps, and identify the losses to be considered for the design power required drive centrifugal pump, use 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. 12 Hrs

Unit-2

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. 10 Hrs

Unit-3

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) Concept of velocity triangles, Force exerted by the jet on a series of flat vanes and series of curved vanes. Equation for work done and efficiency, problems. (Excluding Inclined plates and hinged plates) 10 Hrs

Unit-4

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. 10Hrs

Unit-5

Performance of Hydraulic Turbines: Draft tubes: Types, equation for efficiency, problems, cavitations in turbines, 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, capitation in centrifugal pumps, multistage centrifugal pumps, problems on centrifugal pumps. 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.

Course Outcomes

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

1. Differentiate open channel flow and pipe flow, classify open channels, classify open channel flow and compute the discharge in different types channel sections, design most economical channel sections.
2. Understand critical flow; compute critical depth, critical velocity, hydraulic jump and use of the gauging flumes in open channels.
3. Identify the number of variables in a phenomenon and establish relationship between the variables in a phenomenon.
4. Classify the hydraulic machines and solve numerical problems on hydraulic machines.

Model question paper - P15CV45
Hydraulics and Hydraulic Machines

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each **Unit**.*
ii) Assume suitable missing data if any.

UNIT - I

1. a. Derive Chezy's equation for discharge through an open channel. 10

b. A trapezoidal channel with a side slope of 1:1 has to be designed to convey 10 m3/s at a velocity of 2 m/s, so that the amount of concrete lining for the bed and the sides is minimum. Calculate the area of lining required for one metre length of the canal. 10

2. a. What is specific energy curve? Draw the specific energy curve, and derive the expression for critical depth and critical velocity. 8

b. Derive the condition for maximum discharge for the given value of specific energy. 6

c. The depth of flow of water, at a certain section of rectangular channel of 2 m wide is 0.3 m. The discharge through the channel is 1.5 m3/s. Determine whether a hydraulic jump will occur and if so, find its height and the loss of energy per kg of water. 6

UNIT – II

3. a. Distinguish between dimensional analysis and model analysis. 6

b. State Buckingham's □□- theorem. Why this theorem is considered superior over Raykigh's method of dimensional analysis. 6

c. Find the expression for power P, developed by a pump when P depends upon the head H, the discharge Q and the specific weight w of the fluid. 8

4. a. Define similitude. Explain different types of similarities between model and proto type. 10

b. A 1:15 model of a flying boat is towed through water. The prototype is moving in the sea water of density 1024 kg/m3 at a velocity of 20 m/s. Find the corresponding speed of the model. Also determine the resistance due to waves on the model, if the resistance due to waves of prototype is 600 N. 10

UNIT - III

5. a. Show that the angle of swing of a vertically hanged plate is given by sin□□□□□□av^2/w □10

b. A plate is acted upon at its centre by a jet of water of diameter 20 mm with a velocity of 20 m/s. The plate is hinged and is deflected through an angle of 15º. Find the weight of the plate. If the plate is not allowed to swing, what will be the force required at the lower edge of the plate to keep the place in the vertical position. 10

6 a. Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceeds 50%. 10

b. A jet of water having a velocity of 40 m/s strikes a curved vane, which is moving with a velocity of 20 m/s. The jet makes an angle of 30º with the direction of the motion of the vane at the inlet and leaves at an angle of 90º to the direction of the motion of the vane @

the outlet. Draw the velocity triangles @ inlet and outlet and determine the vane angles at inlet and outlet so that the water enters and leaves the vane without shock.

10

UNIT - IV

7 **a.** Define turbine. Explain with a neat sketch general layout of a hydro electric power plant.

10

b. A Pelton wheel is having a mean bucket diameter of 1 m and is running at 1000 r.p.m. the net head on the Pelton wheel is 700 m. If the side clearance angle is 15º and the discharge through the nozzle is 0.1 m3/s, find,

i) Power available @ the nozzle and

ii) Hydraulic efficiency of the turbine.

10

8 **a**. Obtain the expression for unit speed, unit discharge and unit power of a turbine. 6

b. What are the unit quantities? Define the unit quantities of a turbine. Why are they important? 6

c. A Kaplan turbine runner is to be designed to develop a 100 kW. The net available head is 5.6 m. If the speed ratio is 2.09, flow ratio is 0.68, overall efficiency is 86% and the diameter of the boss is 1/3 the diameter of the runner. Find the diameter of the runner, its speed and specific speed of the turbine. 8

UNIT - V

9 a. What is a draft tube? Why it is used in the reaction turbine? Describe with a neat sketches different types of draft tubes.

10

b. A conical draft tube having diameter at the top has 2 m and the pressure head of 7 m of water (Vacuum), discharges water at the outlet with a velocity of 1.2 m/s at the rate of 25 m3/s. If the atmospheric pressure head is 10.3 m of water and the losses between the inlet and the outlet of the draft tubes are negligible, find the length of the draft tube immersed in water. Total length of tube is 5 m.

10

10 a. Define the specific speed of a centrifugal pump. Derive the expression for the same. 10

b. A centrifugal pump delivers water against a net head of 14.5 m and a design speed of 1000 r.p.m. the vanes are curved back to an angle of 30º with the periphery the impeller diameter is 300 mm and the outlet width is 50 mm. Determine the discharge of the pump, if the manometric efficiency is 95%. 10

Course Title : Highway Engineering			
Course Code : P15CV46	**Semester : IV**	**L-T-P: 4 – 0 – 0**	**Credits: 3**
Contact Period: Lecture: 52 Hr, Exam: 3Hr		**Weightage: CIE:50; SEE:50**	
Prerequisites : Nil			

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^{th} and 21^{st} 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), highway alignment, engineering surveys for highway alignment, highway projects, detail project report (DPR). **10 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, design of vertical alignment – gradient, vertical curves, summit curves, valley curves. problems on above. **10 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, bituminous mix design by Marshall method. Highway constructions – typical components of highway pavement, steps for construction of a new highway, design and

construction of highway embankment and sub-grade, methods of soil compaction, construction of flexible pavements, component 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, construction method using slip-form pavers, construction using fixed form and mechanized technique. **12 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, types of joints in cc pavements and their functions, rigid pavement design methods – using stress equations, as per IRC guidelines, design problems. **10 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, distress in flexible and rigid pavements and maintenance measures, 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. **10 Hrs**

TEXT BOOK:

1. Highway Engineering – S.K. Khanna, C.E.G Justo, and A.Veeraragavan, Nem Chand and Bros, Roorkee, Revised 10th 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

Course Outcomes

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

1. Explain the principles of transportation engineering, highway development & planning. – L2 (Unit – I)
2. Describe the geometric design of highways. – L1 (Unit – II)
3. Explain the highway materials and highway construction. – L2 (Unit – III)
4. Design of highway pavements– L2 (Unit – IV)
5. Discuss about highway maintenance and highway drainage. – L2 (Unit – V)

Model question paper- P15CV46
Highway Engineering

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each **unit**.*
ii) Assume missing data suitably.

UNIT - I

1 a. What are the various modes of transportation? Discuss their relative role, advantages and disadvantages. 10

b. Explain briefly how master plan is prepared and phased in road development program. 10

2 a. Explain with sketches the various factors controlling the alignment of roads. 10

b. Explain briefly the various stages of work in a new highway project. 10

UNIT - II

3 a. A state highway with a design speed of 80kmph is passing through a rolling terrain. Calculate the radius of curve, absolute minimum sight distance and length of transition curve for the following data:
Longitudinal friction coefficient = 0.35
Rate of introduction of super-elevation = 1 in 150
Pavement is rotated about the inner edge
All other data may suitably assume as per IRC guidelines. 10

b. The design speed of a two-lane single carriage way is 65 kmph. The radius and length of a horizontal curve is 400 m and 200 m respectively. Calculate the set-back distance for the requirements of stopping sight distance and overtaking sight distance. Assume total width including ultra width as 7.6 m. 10

4 a. A vertical curve is to be designed when two grades +2.0% and -1.25% meet on a highway with a design speed of 100 kmph. Due to site conditions, the length of vertical curve has to be registered to maximum of 500 m. Calculate the length of curve needed to fulfill the requirements of stopping sight distance and overtaking sight distance or at least intermediate sight distance and hence comment on the results. 10

b. Explain summit and valley curves and the various cases when these are formed while two different gradients meet. Discuss the design requirements of summit and valley curves. 10

UNIT - III

5 a. Explain the desirable properties of road aggregates. List the various tests on road aggregates and indicate the permissible values to be used in road construction. 10

b. Explain CBR and laboratory test procedure to obtain CBR. How are the results of the test obtained and interpreted? 10

6 a. Mention the method of configuration and quality control for a granular sub-base layer. 10

b. Mention the configuration steps and quality control tests for the configuration of CC pavements slab. 10

UNIT - IV

7 a. What are the various factors to be considered in pavement design? Discuss the significance of each. 10

b. Give a sketch showing the various layers in pavement, generally adopted in India. What are the functions and importance of each of these layers? 10

8 a. Discuss Westergaard's concept of temperature stresses in concrete pavement. 10

b. Calculate the wheel load stresses at interior, edge and corner regions of a cement pavement using Westergaard's stress equations for the following data: Wheel load = 5100 kg, pavement thickness = 18 cm, Radius of contact = 15 cm modulus of elasticity of cement concrete = 3x105 kg/cm2, Poisson's ratio of concrete = 0.15, modulus of subgrade reaction = 6 kg/cm3. 10

UNIT - V

9 a. What are the different types of localised distresses in bituminous pavements? Mention the general causes. 10

b. List various types of structural distresses that develop in cement concrete pavements. Mention the features and causes of these distresses. 10

10 a.Discuss the importance of highway drainage. What are the requirements of a good highway drainage system? 10

b. Explain with sketches how the subsurface drainage system is provided to lower the water table and control seepage flow. 10

Course Title : Applied Surveying Practice			
Course Code : P15CVL47	**Semester :** IV	**L - T - P :** 0 - 0 – 3	**Credits:** 1.5
Contact Period: Lecture: 39 Hr, Exam: 3 Hr		**Weightage:** CIE:50; SEE:50	

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: To set out compound curve with angular methods using Total Station.

Exercise - 10: Traversing and area calculation using Total Station

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

.**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, 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. Schimidt - Wong, Thomson Learning.

Scheme of Examination:

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

Course Title : Hydraulics and Hydraulic Machine Lab			
Course Code : P15CVL48	**Semester :** IV	**L - T - P** : 0 - 0 - 3	**Credits:** 1.5
Contact Period: Lecture: 39Hr, Exam: 3Hrs		**Weightage:** CIE:50; SEE:50	

Prerequisites : Nil

Course Learning Objectives (CLOs)

This course aims to

1. Predict discharge using V-notch.
2. Predict discharge using rectangular or Trapezoidal notch.
3. Predict discharge using Ogee weir.
4. Compute discharge using Broad crested weir.
5. Compute discharge using Venturi flume.
6. Compute discharge using Venturi meter.
7. Determine Darcy's friction factor for a straight pipe.
8. Determine minor loss constants.
9. Determine vane coefficient for flat and hemispherical vanes.
10. Determine hydraulic coefficient of a vertical orifice.
11. Conduct tests on a single stage or multi stage centrifugal pump (constant speed).
12. Conduct tests on a Pleton wheel.
13. Conduct tests on Francis or Kaplan turbine.
14. Demonstrate working of Rain gauges.

Course Content

Experiments

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, Sudden contraction, sudden expansion)
Ex 9: Determination of vane coefficient for 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 Pleton wheel.
Ex 13: Performance tests on Francis or Kaplan turbine.
Ex 14: Demonstration on working of Rain gauges.

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

Course Outcomes

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

1. Measure the pressure in pipes
2. Demonstrate Bernoulli's equations.
3. Calibrate various notches and weirs.
4. Study the performance of hydraulic machines.

Course Title : Aptitude and Reasoning Development - INTERMEDIATE (ARDI)			
Course Code : P15HU49	**Semester :** IV	**L - T - P :** 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. Identify the assumptions, analyse the given argument and evaluate the inference.
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

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. **6 hrs**

Unit – II

Analytical reasoning 2: The basics of logic, some informal tips, **Assumptions**– Some standard categories of assumptions, Where is the assumption invalid?, **Forcefulness of arguments**– Preliminary screening, Will the results really follow?, Is the result really desirable?, Are the argument and suggested course of action properly related?, **Evaluating Inferences**– A study of key words, How to avoid confusion?, **Evaluating given course of action**– Problem -solution relation, Fact-follow-up action relationship. **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. **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. **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. **4 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 (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 statements and identify the assumptions and infer the results based on the arguments or premises. 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 effectives ways of deriving at the conclusion. L4
6. Determine the solutions for complicated problems of set theory using the concept of venn diagram. L4

Course Title : Additional Mathematics-II (A Bridge course for Diploma qualified students of IV Sem. B. E.)			
Course Code : P15MADIP41	**Semester :** IV	**L :T:P:H :** 2:2:0:4	**Credits:** NA
Contact Period: Lecture: 52 Hr,	**Weightage: CIE:**100%, [P/NP]		

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,42nd Ed. 2012.

References:

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

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

Course Title : Environmental Studies			
Course Code: P15EVDIP410	**Semester : I/II**	**L-T-P-H: 2–0-0-2**	**Credits: NA**
Contact Period : Lecture :26 Hr		**Weightage :CIE:100% - [P/NP]**	

Prerequisites:

The student should have undergone the course on Environmental Studies (Code: P15EV19/29)

a) ***Course Learning Objectives (CLO) :***

At the end of the course the students should be able to:

1 Explain the need for Environmental Management
2 Implement standard data like water, wastewater and air pollution.
3 Demonstrate the use of standard data to compare with the field data.
4 Choose appropriate data to protect environmental.
5 Design environmental amenities based on the needs.

b) Relevance of the Course

Environmental Studies is a foundation course in BE (Environmental Engineering) program, that builds the program design and implementation competence in student through choice of appropriate areas.

The course aims at developing the understanding variations in water, wastewater and air pollution and also the ability to build new ideas.

Course Content

Unit – I

Environment – Definition, Ecosystem – Balanced Ecosystem, Human activities – Food Shelter, Economic and Social Security. Transportation activities, Environmental impact Assessment, Sustainable Development. **6 Hrs.**

Unit – II

Natural Resources – Water resources – Availability and Quality aspects, Mineral Resources, Forest Wealth, Material Cycles – (Carbon, Nitrogen and Sulphur Cycles) Water borne diseases, water induced diseases, Fluoride problem in drinking water. 5**Hrs.**

Unit – III

Energy – Different types of energy, Conventional and Non-Conventional sources – Hydro Electric, Fossil fuel based, Nuclear, Solar, geothermal, tidal, wind, Biomass and Bio-gas. Hydrogen as an alternative future source of energy. **5 Hrs.**

Unit – IV

Environmental Pollution and their effects. Water pollution, Land pollution, Noise pollution Public Health aspects. Current Environmental issues of importance: Population Growth Climate change and Global warming – Effect, Urbanizations industrialization. **5 Hrs.**

Unit –V

Acid Rain, Ozone layer depletion, Animal Husbandry. Environmental protection – Role o Government, Legal aspects, initiatives by Non-Governmental Organizations (NGO Environmental Education, Women Education. **5 Hrs.**

Text Book:

1)Environmental Studies – Benny Joseph – Tata McGraw Hill – 2005

References:

1)Principles of Environmental Science and Engineering – .VenugopalaRao P, Prentice Hall 2005
2)Elements of Environmental Science and Engineering – Meenakshi P, Prentice Hall of India, 2
3)Environmental Studies – Anil Kumar D.C, New age International Publishers, 2007