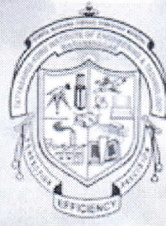An Autonomous Institute

Shree Warana Vibhag Shikshan Mandal's
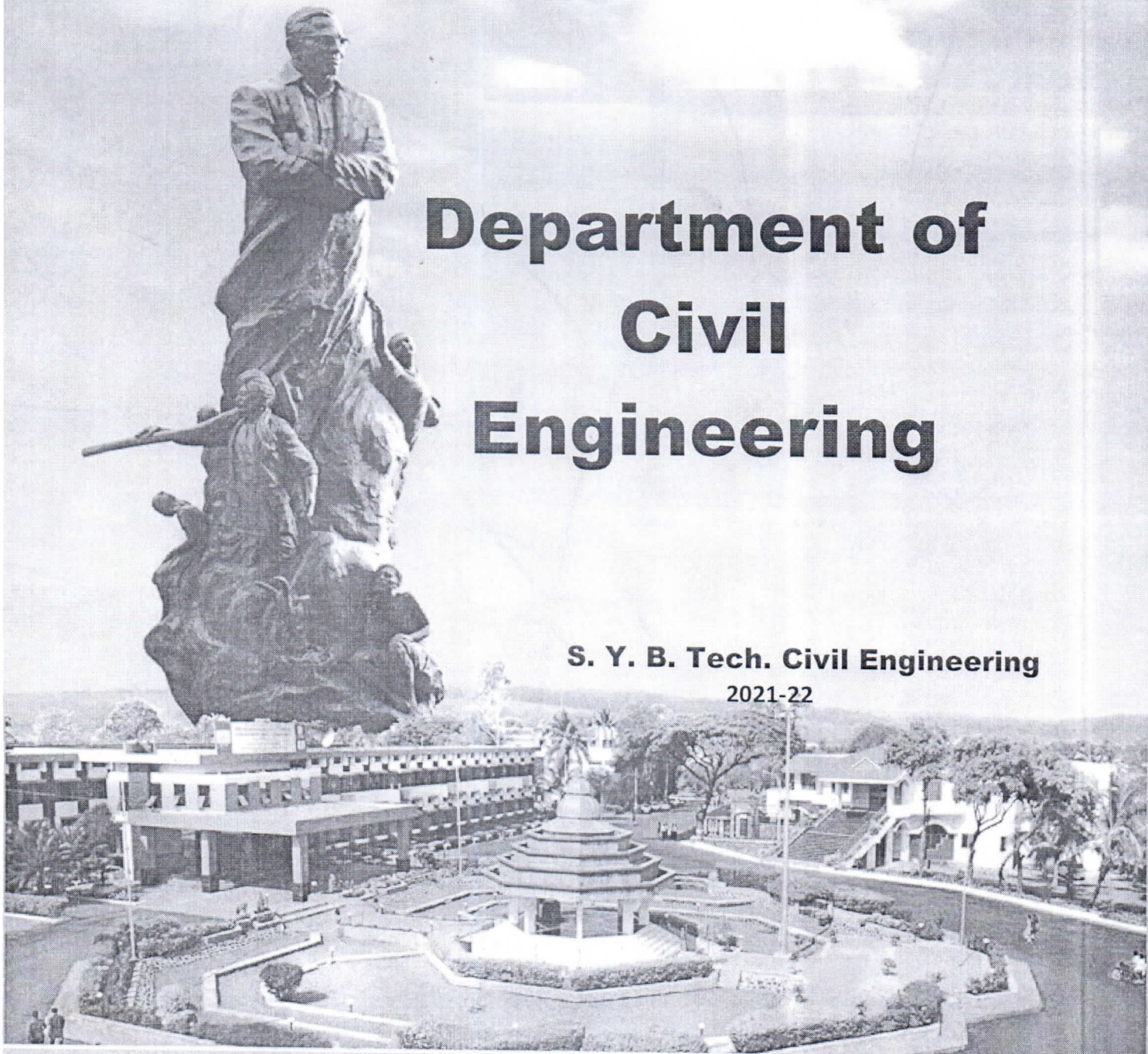**Tatyasaheb Kore Institute of Engineering And Technology, Warananagar**
NBA Accredited Institute

Department of Civil Engineering

S. Y. B. Tech. Civil Engineering
2021-22

B. Tech. In Civil Engineering
Syllabus Structure and Curriculum under Autonomy

Tatyasaheb Kore Institute of Engineering andTechnology, Warananagar
An Autonomous Institute

Abbreviations

Sr. No.	Acronym	Definition
1	ISE	In-Semester Examination
2	ISE-I	In-Semester Examination-I
3	ISE-II	In-Semester Examination-II
4	ESE	End Semester Examination
5	ISA	In-Semester Assessment (Term Work)
6	L	Lecture
7	T	Tutorial
8	P	Practical
9	CH	Contact Hours
10	C	Credit

Course/ Subject Categories

| Sr. No.	Acronym	Definition
1	BSC	Basic Science Course
2	HSC	Humanity Science Course
3	ESC	Engineering Science Course
4	PCC	Professional Core Course
5	OEC	Open Elective Course
6	MC	Mandatory Course
7	PEC	Professional Elective Course
8	PW	Project Work (Mini and Major Project)
9	II	Industrial Internship

CO ,PO & PSO Mapping Correlation:

Low	Medium(Moderate)	High(Substantial)
1	2	3

Course/ Subject Code

M	E	3	0	1
Branch Code		Semester	Course Number	

Course Term work and POE Code

M	E	3	0	1	T / P / A
Branch Code		Semester	Course Number		T- Term work P- POE A- Audit Course
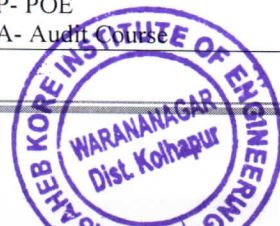
Tatyasaheb Kore Institute of engineering and Technology, Warananagar
An Autonomous Institute
Department of Civil Engineering

Vision

To become an academy of excellence in technical education and humanresource development.

Mission

- To develop engineering graduates of high repute with professional ethics.

- To excel in academics and research through innovative techniques.

- To facilitate the employability, entrepreneurship along with social responsibility.

- To collaborate with industries and institutes of national recognition.

- To inculcate lifelong learning and respect for the environment.

Quality Policy

To promote excellence in academic and training activities by inspiring students for becoming competent professionals to cater industrial and social needs.

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar
(An Autonomous Institute)

S.Y. B. Tech. In CIVIL Engineering
Syllabus under Autonomous Status of TKIET, Warananagar

2021-22

TATYASAHEB KORE INSTITUTE OF ENGINEERING & TECHNOLOGY, WARANANAGAR

Department of Civil Engineering

4.1 Program Educational Objectives (PEO's)

After completion of program, Graduates will be able to

1	To Impart quality technical education and graduate the students for employment in civil engineering and related professions.
2	To provide students with solid foundation in mathematical and analytical subjects so as to solve civil engineering problems and also to pursue higher studies.
3	To develop the ability among the students to organize the data, synthesize data and technical concepts which will helps them to solve problems relevant to the general practice of various civil engineering disciplines
4	To inculcate with the student the expertise of using computer tools to solve problems, for presentations works, acquaint them with professional level software for planning , analysis and design purpose
5	To provide an experience in surveying work, site investigations, familiarity with the real issues of civil engineering including ethics, economy, management and emerging technologies
6	To provide an opportunity for the students to work in team by organizing various curricular and professional activities resulting in the improvement of technical and soft skills.

TATYASAHEB KORE INSTITUTE OF ENGINEERING & TECHNOLOGY, WARANANAGAR

## Department of Civil Engineering

4.2 Program Outcomes (POs)

After completion of program, Graduates will be able to

PO1	**Demonstrate** knowledge in mathematics, basic sciences & civil engineering
PO2	**Identify**, formulate and solve civil engineering problems.
PO3	**Prepare** structural design such that fulfills design specification, durability, economy & safety.
PO4	**Design** and conduct experiment, analyze data & also interpret result to provide conclusion.
PO5	**Use** appropriate engineering techniques & software tools to analyze civil engineering problems.
PO6	**Apply** civil engineering knowledge for construction site in all respect like planning, execution and supervision.
PO7	**Sensitive** towards ethical, societal & environmental issue along with professional work.
PO8	**Exhibit** understanding of professional & ethical responsibility.
PO9	**Ability** to function as a leader of multidisciplinary team.
PO10	**Communicate** effectively in both verbal & written form.
PO11	**Develop** engineering research ability & project management skill.
PO12	**Possess** confidence for self education & ability for lifelong learning.

PROGRAM SPECIFIC OUTCOMES
After completion of program, Graduates will be able to

1	Plan and Design, Maintain and execute smart infrastructural projects.
2	Assess and analyze environmental impact of civil engineering projects and take corrective action for sustainable development.
3	Use leadership and communication abilities to optimally integrate the 4Ms viz.- Men, Money, Material and Machine
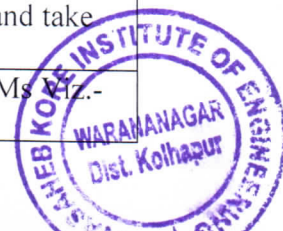
Second Year B. Tech. In CIVIL Engineering

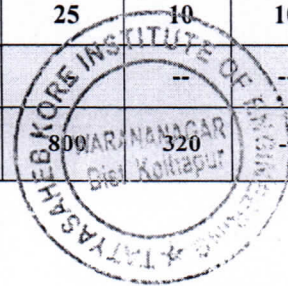**Syllabus Structure under Autonomous Status of TKIET, Warananagar**

2021-22

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar
Second Year B. Tech. (Civil Engineering)
Semester-III
(To be implemented from 2021 - 22)

Credit Scheme

Course Code	Category	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
			L	T	P	C	CH	Component	Marks	Min for Passing	
CE301	PCC	Strength of Materials	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
CE302	PCC	Surveying	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
CE303	BSC	Applied Mathematics	2	-	--	2	2	ESE	60	24	40
								ISE	40	16	
CE304	PCC	Fluid Mechanics	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
CE305	PCC	Building Construction and Drawing	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
CE303T	BSC	Applied Mathematics	-	1	-	1	1	ISA	25	10	10
CE305T	PCC	Building Construction and Drawing	--	-	2	1	2	ISA	50	20	20
CE306T	PCC	Computer Aided Drawing	--	--	2	1	2	ISA	25	10	10
CE307T	ESC	Numerical Method	-	--	2	1	2	ISA	25	10	10
CE301P	PCC	Strength of Materials	--	--	2	1	2	ISA	25	10	10
								POE	25	10	10
CE302P	PCC	Surveying	--	--	2	1	2	ISA	50	20	20
								POE	25	10	10
CE304P	PCC	Fluid Mechanics	--	--	2	1	2	ISA	25	10	10
								POE	25	10	10
CE 309A	MC	Audit Course – III Environmental studies)	-	--	2	--	2	--	--	--	--
			14	1	14	21	29	--	800	320	--

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

Second Year B. Tech. (Civil Engineering)

Semester-IV

(To be implemented from 2021 - 22)

Credit Scheme

| Course Code | Category | Course Title | Teaching Scheme | | | | | Examination & Evaluation Scheme | | |
			L	T	P	C	CH	Component	Marks	Min for Passing
CE401	PCC	Mechanics of structures	3	--	--	3	3	ESE	60	24 / 40
								ISE	40	16
CE402	PCC	Advanced Surveying	3	--	--	3	3	ESE	60	24 / 40
								ISE	40	16
CE403	PCC	Concrete Tech.	3	--	--	3	3	ESE	60	24 / 40
								ISE	40	16
CE404	PCC	Hydraulics	3	--	--	3	3	ESE	60	24 / 40
								ISE	40	16
CE405	PCC	Building Planning & Design	3	--	--	3	3	ESE	60	24 / 40
								ISE	40	16
CE401T	PCC	Mechanics of structures	--	-	2	1	2	ISA	25	10 / 10
CE404T	PCC	Hydraulics	--	-	2	1	2	ISA	25	10 / 10
CE406T	PCC	Design and development of civil structure model	--	-	2	1	2	ISA	50	20 / 20
CE402P	PCC	Advanced Surveying	--	--	2	1	2	ISA	25	10 / 10
								POE	25	10 / 10
CE403P	PCC	Concrete Tech.	--	-	2	1	2	ISA	50	20 / 20
								POE	25	10 / 10
CE405P	PCC	Building Planning & Design	-	--	2	1	2	ISA	50	20 / 20
								POE	25	10 / 10
CE407A	MC	Audit Course – IV General Proficiency)	2	--	--	--	2	--	--	-- / --
			17	-	12	21	29	--	800	320 / --
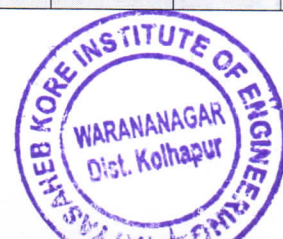
Second Year B. Tech. Civil Engineering

First Semester Detailed Syllabus

CE301- STRNGTH OF MATERIALS

Lectures	:	3 Hrs/Week	**Evaluation Scheme**		
Credit	:	3	ISE	:	40 Marks
Tutorials	:	---	ESE	:	60 Marks

Course Objectives: The objective of the course is to
1. To develop an understanding of the basic principles of Structural Analysis.   2. Study the internal effects and deformations caused by the applied loads.   3. Understand the analysis and design aspects of structural engineering.

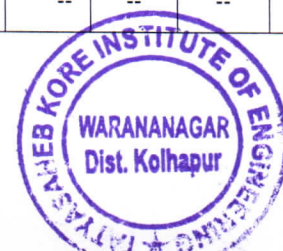| Course Outcomes:		
COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Evaluate the response of elastic body for external actions and compute design forces	Knowledge Understand
CO2	Deal different engineering properties and behaviour of the materials like ductility, toughness etc.	Understand
CO3	Understand the Different forces in trusses	Understand
CO4	Analyze bending stresses for different shape of the flexural member	Understand
CO5	Justify Shear Stress under different cross section	Apply Evaluate
CO6	Interpret the stress distribution within the cross section when subjected to various actions and study of strain energy for different action	Apply

Description:
Strengths of Material is focused on analyzing stresses and deflections in materials under load. Knowledge of stresses and deflections allows for the safe design of structures that are capable of supporting their intended loads. Life of the Civil Components is greatly influenced by the Load and material properties So analysis of load and mechanical properties identification is very important task to select the appropriate material, One should know about required properties for specified task. This course deals with different engineering material and their properties. And several analysis methods

Prerequisites:	1:	Basics of Engineering Mechanics
	2:	Resultant and moment Calculation
	3:	Moment of Inertia

Section – I
Simple Stress & Strain:

Unit 1	Engineering properties of different materials, Simple stress and strain, Hooke's law, elastic behavior of the body under external actions. Composite sections under axial loading, Temperature stresses and strains, Elastic constants, Normal stresses and strains in three dimensions.	6 Hrs
	Shear force diagram & bending moment diagram for determinate beams:	
Unit 2	Concept of Determinate structure, Fundamentals of Shear force & Bending Moment, Relationship between SFD, BMD & load, SFD & BMD due to point load, UDL, UVL & moments/couples.	6 Hrs
	Analysis of trusses	
Unit 3	Introduction to truss. Types of Truss, Assumptions made in analysis of truss, Analysis of pin jointed truss using method of joints & method of sections.	6 Hrs
Section – II		
	Bending stresses:	
Unit 4	Introduction to bending stresses, Theory of pure bending. Derivation of flexural formula. Bending stresses for symmetrical & unsymmetrical section.	6 Hrs
	Shear stresses in beam:	
Unit 5	**Fundamentals of Shear stresses, Shear stress distribution diagrams of standard section, Shear stress distribution for symmetrical & unsymmetrical section.**	6 Hrs
	Strain Energy and thin walled cylinder:	
Unit 6	**Strain energy** due to different types of actions, suddenly applied load, gradually appliedload & impact load, strain energy method for deflection of determinate beams. **Concept of thin walled cylinder**, Hoop and circumferential stresses, Analysis of thin walled cylinder.	7 Hrs

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1	2			1	--	--	---	--	--	--	--	--	--	--
CO2	1	2	1	2		--	--	--	--	--	--	--	--	--	--
CO3	1	2				--	--	--	--	--	--	--	--	--	--
CO4			2	2	2	--	--	--	--	--	--	--	--	--	--
CO5	1	2	2			--	--	--	--	--	--	--	--	--	--
CO6	1	2			1	--	--	--	--	--	--	--	--	--	--

References:

Text Books
1	ngth of Materials" - R.K.Bansal., Laxmi Publications.
2	"Strength of Materials" - S Ramamrutham, DhanapatRai Publications.
3	"Structural Analysis" - Bhavikatti S.S, Vikas Publications house New Dehli.
4	"Strength of Materials" - R.K.Rajput., S.Chand Publications.
Reference Books
1	"Mechanics of Materials" - Gere and Timoshenko, CBS publishers.
2	"Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
3	"Mechanics of Material" - Beer and Johnston, M.

CE302- SURVEYING

Lectures	:	3 Hrs/Week	Evaluation Scheme		
Credit	:	3	ISE	:	40 Marks
Tutorials	:	---	ESE	:	60 Marks

Course Objectives: The objective of the course is to

4. To obtain a full understanding of the methods of measurement, errors to be expected, and their control.
5. To know the basics of levelling and theodolite survey in elevation and angular measurements.
6. To find out area and volumes using various instruments.
7. To study the significance of plane table surveying in plan making.
8. To be able to use minor instruments with efficiency.
9. To understand the importance of surveying in the field of civil engineering.

Course Outcomes:		

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Take linear and angular measurements	Knowledge Understand
CO2	Record various measurements in the field book	Understand
CO3	Find areas of irregular figures by using mathematical formulas and Planimeter	Understand and Apply
CO4	Carry out traversing to fill interior details by plane table survey and theodolite.	Apply Evaluate
CO5	Adopt appropriate method of surveying	Apply

Description:

Surveying, a means of making relatively large-scale, accurate measurements of the Earth's surfaces. It includes the determination of the measurement data, the reduction and interpretation of the data to usable form, and, conversely, the establishment of relative position and size according to given measurement requirements.

Prerequisites:	1:	Basics of Surveying
	2:	Area and Volumes
	3:	Chain, tape

	Section – I	
	Levelling and Contouring	
Unit 1	Introduction to levelling. Permanent Adjustments of dumpy level. eciprocal levelling, Sensitivity of bubble tube, Corrections – curvature and refraction. Contouring – methods and applications.	8 Hrs
	Areas and volumes	
Unit 2	Planimeter – Area of Zero Circle and Numerical, Digital Planimeter. - Trapezoidal, Simpsons rule, Mid - ordinate rule, Average ordinate. Volume- Trapezoidal and Simpsons Rule, Capacity contouring	5 Hrs
	Plane Table Surveying	
Unit 3	Principles, accessories, significance and adjustments. Methods and applications of plane table survey.	5 Hrs
	Section – II	
	Theodolite	
Unit 4	Vernier theodolite – components, uses and adjustments. Applications – Trigonometrical levelling	6 Hrs
	Theodolite Traversing	
Unit 5	Objectives, traverse table, plotting. **Omitted measurements.**	7 Hrs
	Applications	
Unit 6	Usage of minor instruments- Hand Level, Abney Level, Ghat Tracer and Box Sextant. Hydrographic survey. Tunnel survey	5 Hrs

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1	2			1	--	--	---	--	--	--	--	--	--	--
CO2	1	2	1	2		--	--	--	--	--	--	--	--	--	--
CO3	1	2			2	--	--	--	--	--	--	--	--	--	--
CO4		1	1	2	2	--	--	--	--	--	--	--	--	--	--
CO5	1	2	2		1	--	--	--	--	--	--	--	--	--	--

References:

Text Books
1. **Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni, Pune** arthi Griha Prakashan
2. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain, Laxmi cations.
3. Surveying and Levelling by N. N. Basak, Tata McGraw Hill
4. Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill
5. Surveying and Levelling - R. Agor, Khanna Publishers, New Delhi
Reference Books
1. Principles of Surveying. Vol. I by J. G. Olliver, J. Clendinning - Van Nostrand Reinhold
2. Plane Surveying by A. M. Chandra, New Age International Publishers
3. Surveying Vol. I & II by Dr. K. R. Arora, Standard Book House
4. Plane surveying – David Clark.

CE303 : APPLIED MATHEMATICS

			Evaluation Scheme		
Lectures	:	2 Hrs/Week	**ISE**	:	40 Marks
Credit	:	2	**ESE**	:	60 Marks

Course Objectives: The objective of the course is to

1. Develop mathematical skills and enhance thinking power of students.

2. Give the knowledge to the students of Linear Differential Equations, Vector Differential Calculus, Probability, Numerical methods of solving Algebraic and Transcendental equations with an emphasis on the application of solving engineering problems.

3. Prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.
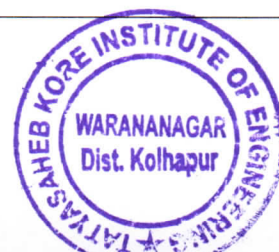
Course Outcomes:		
COs	**At the end of successful completion of the course, the student willbe able to**	**Blooms Taxonomy**
CO1	Solve Linear Differential Equation of higher order	Knowledge Understand
CO2	Make use of Linear Differential Equations to solve the Civil Engineering problems.	Apply
CO3	Use several methods of solving algebraic and transcendental equations of one variable.	Knowledge Apply
CO4	Calculate divergence, curl, gradient and directional derivative of a vector and scalar point function	Knowledge
CO5	Use Binomial, Poisson and Normal distributions to calculate probabilities	Apply
CO6	Describe the statistical data numerically by using Curve fittings.	Evaluation

Description:

Applied Mathematics course is offered as the basic science course. This course contains Mathematical methods and techniques that are used to solve complex Civil engineering problems. This course has six units namely i) Linear Differential equation, ii) Applications of Linear Differential Equations iii) Numerical Solution of Algebraic and Transcendental Equations iv) Vector Differential Calculus v) Probability Distribution and vi) Curve Fitting.

Prerequisites:	1:	Trigonometric identities and Logarithmic identities
	2:	Differentiation and integration formulae
	3:	Probability.

	Section – I	
Unit 1	**Linear Differential Equations with constant Coefficients** Linear Differential Equation with constant coefficients-Definition, Rules to find complementary function. Methods to find Particular Integrals (e^{ax}, $\sin ax$ and $\cos ax$, x^m, $e^{ax}x^m$, $e^{ax}\sin ax$, $e^{ax}\cos ax$)	**5 Hrs**
Unit 2	**Applications of Linear Differential Equations with constant Coefficients** Applications of Linear Differential Equations with constant coefficients to Cantilever, Strut, Beam.	**4 Hrs**
Unit 3	**Numerical Solution of Algebraic and Transcendental Equations** Numerical solutions of algebraic and transcendental equations by using 1. Bisection method 2. Secant method 3. Newton-Raphson method.	**4 Hrs**
	Section – II	
Unit 4	**Vector Differential Calculus** Differentiation of vectors. Gradient of scalar point function. Directional derivative. Divergence of vector point function. Curl of a vector point function. Irrotational, Solenoidal and Scalar potential function of a vector field.	**5 Hrs**
Unit 5	**Probability Distribution** Random variables, Discrete Probability distribution, Continuous probability distribution. Binomial Distribution. Poisson Distribution. Normal Distribution	**4 Hrs**
Unit 6	**Curve Fitting** Fitting of Curves by method of Least-squares: 1. Fitting of Straight lines. 2. Fitting of second degree Parabolic curves 3. Fitting of exponential curves.	**4 Hrs**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1	--	--	--	--	--	---	--	--	--	--	--	--	--
CO2	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--
CO3	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--
CO4	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--
CO5	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--
CO6	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--

References:

Text Books	
1	Higher Engineering Mathematics, Dr. B. S. Grewal, S. Chand and Company, 40th Edition.
2	Advanced Engineering Mathematics, H. K. Das, S. Chand Publication, 8th Edition.
Reference Books	
1	Higher Engineering Mathematics, B. V. Ramana, Tata Mc Graw Hill, New Delhi
2	A Text Book of Applied Mathematics, Vol. I and II, P. N.Wartikar and J. N. Wartikar, Vidyarthi Griha Prakashan, Pune.
3	A textbook of Engineering Mathematics, N. P. Bali, Iyengar, Laxmi Publications (P) Ltd, New Delhi
4	Advanced Engineering Mathematics,Erwin Kreyszig, Wiley India Pvt. Ltd

Web Links/ Video Lectures

1. https://nptel.ac.in/courses/111/104/111104031/   2. https://nptel.ac.in/courses/122/102/122102009/
3. https://nptel.ac.in/courses/111/104/111104032/   4. https://nptel.ac.in/courses/111/105/111105042/

CE304:FLUID MECHANICS

Lectures	:	3 Hrs/Week	**Evaluation Scheme**	
Credit	:	3	ISE :	40 Marks
Tutorials	:	---	ESE :	60 Marks

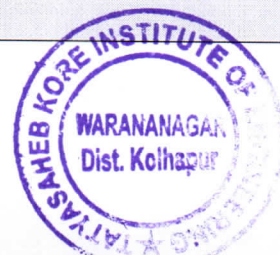| **Course Objectives:** The objective of the course is to |
|---|
| 1. To study processes and science of fluid and their properties.
 2. To study pressure measuring devices and pressure diagram.
 3. To apply basic principles in fluid flow problems.
 4. To identify the losses in pipes. |

Course Outcomes:

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Study the basic properties of fluids and their behavior under application of various force systems.	Knowledge Understand
CO2	Discuss the basic concepts and principles in fluid statics, fluid kinematics and fluid dynamics with their applications in fluid flow problems.	Understand
CO3	Recognize the principles of continuity, momentum and energy as applied to fluid in motion.	Understand
CO4	Apply the equations to analyze problems by making proper assumptions and learn systematic engineering methods to solve practical fluid mechanics problems	Apply Evaluate

Description:

Without Fluid survival of Living Organism is highly impossible. Whole Engineering sector is greatly influenced by Fluid. Fluid Mechanics helps to understand the behavior of fluid under various forces and at different atmospheric conditions, and to select proper fluid for various applications. In this course students will learn about fundamentals, properties, principles and governing equations of fluid behavior in statics and in motion. Students willget new problem solving approaches like control volume concept, streamline patterns and fluid flow analysis. This course has six units namely i) Fluid Properties ii) Fluid Statics iii) Fluid Kinematics iv) Fluid Kinetics v) Laminar and turbulent Flow v) Losses in pipes

Prerequisites:	1:	Applied Mechanics
	2:	Engineering Mathematics
	3:	Engineering Physics
	4:	Basic Civil Engineering

	Section – I	
	Properties of fluid:	
Unit 1	**Introduction:** Physical Properties of Fluids (Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity: Dynamic and Kinematic Viscosity, Compressibility, Surface tension, Capillary Effect, Vapour Pressure and Cavitation), Newton's law of viscosity, Types of Fluids. Pressure, Types of Pressure, Pascal's Law, Hydrostatic Law.	**7Hrs**
	Fluid Statics:	
Unit 2	A. A. Pressure Measuring Devices, Pressure Head, Pressure Diagram, Total Pressure and Centre of Pressure, Forces on Plane and Curved Surfaces. Forces on vertical walls, gates and dams. B. Buoyancy and Floatation: Archimedes's Principle, Metacentre, Stability of Submerged and Floating Bodies.	**7Hrs**
	Fluid Kinematics:	
Unit 3	Types of Flows, Stream lines, Streak Line, Path Line, Stream Tube, Stream Bundle, Equipotential lines, velocity and acceleration of fluid, Stream Function and Velocity Potential Function, Flow Net- (Properties and Uses), Continuity Equation (3-D Cartesian Form).	**6 Hrs**
	Section – II	
	Fluid Kinetics:	
Unit 4	Forces Acting on Fluid in Motion, Euler's Equation along a Streamline, Bernaulies equations, Bernoulli's Theorem assumptions, Limitations and modifications. Bernoulli's Applications: Venturimeter (Horizontal andVertical), Orificemeter, Orifices, Time required for Emptying the Tank, Concept of HGL and TEL.Therotical and Experimental determination of hydraulic coefficients of orifice. Introduction of mouthpiece and Rotameter.	**7Hrs**
	Laminar and Turbulent Flow:	
Unit 5	Laminar Flow and Turbulent Flow: Reynold's Experiment, Hazen Poisulle's Equation for Viscous Flow through Circular Pipes, Prandtl Mixing Length Theory, Introduction to Moody's Chart.	**4Hrs**
	Losses in Pipes:	
Unit 6	A. Major and Minor Losses, Darcy-Wiesbach Equation, Concept of Equivalent Pipe, Dupit's Equation. B. Pipes in Series, Parallel and Syphon, Two Reservoir Problems, Three Reservoir Problems Concept of Water hammer. Surge Tanks (Function, Location and Uses).	**5Hrs**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1	2		1		2	--	---	--	--	--	--	--	--	--
CO2		2	1	2		1	--	--	--	--	--	--	--	--	--
CO3	2	1		1		--	--	--	--	--	--	--	--	--	--
CO4		2			1	1	--	--	--	--	--	--	--	--	--

References:

Text Books	
1	Mechanics – A.K. Jain – Khanna Pub., Delhi.
2	Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi/Seth – Standard Book House, Delhi.
3	Fluid Mechanics and hydraulic machine-R.K.Bansal, Laxmi Pubication.
4	Fluid Mechanics – Garde-Mirajgaonkar – Nemchandand Bros., Roorkee.
5	Fluid Mechanics – S. Nagrathanam – Khanna Pub., Delhi.
Reference Books	
1	Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland.
2	Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd. Tokyo.
3	Fundamentals of Fluid Mechanics, Munson, Young, Okiishi, Huebesch, Wiley Publication
4	Fluid Mechanics – Shames - McGraw-Hill International Book Co., Auckland

CE305 - BUILDING CONSTRUCTION AND DRAWING

Lectures	:	3 Hrs/Week	**Evaluation Scheme**		
Credit	:	3	ISE	:	40 Marks
Tutorials	:	---	ESE	:	60 Marks

Course Objectives: The objective of the course is to
1. To understand different types of masonry work using stones, bricks, blocks. 2. To understand the various types of doors and windows with their components. 3. To understand the requirements of good stairs and design of stairs. 4. To understand Principles of Building planning. 5. To understand building bye laws and planning of Residential building. 6. To understand concepts of Low cost housing, green building and Maintenance, Repairs, Rehabilitation of Structures.

Course Outcomes:		
COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Demonstrate different bonds in brick and stone masonry.	Understand
CO2	State and produce drawings of different building components.	Remember Apply
CO3	Design, Plan and draw different types of staircase.	Create Apply
CO4	State and explain principles of building planning and Bye-Laws.	Remember Understand
CO5	Design, Plan and draw residential building line plan.	Create Apply
CO6	Describe concepts of Low cost housing, Green building, maintenance, repair and rehabilitation of structure.	Remember

Description:		
Civil engineering deals with development of different Infrastructures. Building Construction is one of the important sectors in Infrastructure development. Basic need of Building construction is getting Knowledge and design of its various components. Planning and designing of residential building requires understanding and apply concepts of site selection criterions, principles of building planning, byelaws, rules and regulations etc.		
Prerequisites:	1:	Components of building.
	2:	Building Construction materials.
	3:	Technical Drawing Concepts.

Section – I			
Unit 1		**1.1** Basic requirements of a building as a whole: Strength and stability, Dimensional stability, comfort and convenience, damp prevention, water-proofing techniques, heat insulation, day lighting and ventilation. Sound insulation and anti termite treatment. **1.2** Stone Masonry: Random Rubble, Uncoursed Rubble, Coursed Rubble and Ashlar Masonry. **1.3** Brickwork and Brick Bonds (English, Flemish), Composite masonry.	**6 Hrs**
Unit 2		**2.1** Lintel: Necessity, Materials (wood, stone, brick, steel, R.C.C. and reinforced brick lintels.) **2.2** Arches: components , types **2.3** Doors: Classification, T.W. Paneled Door, Flush Door, Aluminum Glazed Doors, Steel Doors, fixtures and fastening. **2.4** Windows: Classification, T.W. Glazed Windows, Aluminum Glazed Windows, fixtures and fastening.	**6 Hrs**
Unit 3		**3.1** Stairs: Technical terms, requirements of a good stair, uses, types, materials for construction. Design of stairs (Dog Legged, quarter turn and Open Well), Ramps, Lifts and Escalator	**6 Hrs**
Section – II			
Unit 4		**4.1** Site Selection criteria, Principles of Building planning, Significance Sun path diagram, Wind Diagram, Orientation, Factors affecting, criteria under Indian condition. **4.2** Dimensions & space requirement in relation to body measurements, Human body figures and its applications in space design of service elements.	**6 Hrs**
Unit 5		**5.1** Building Planning Byelaws and regulations: As per SP-7, 2016 National Building code of India. **5.2** Planning of Residential Building: (Bungalows, Twin Bungalows, Row Bungalows and Apartments) **5.3** Procedure of Building Permission, significance of commencement, plinth completion or occupancy certificate.	**6 Hrs**
Unit 6		**6.1** Low cost Housing: Materials and Methods (conceptual introduction only) **6.2** Maintenance, Repairs, Rehabilitation of Structures: (Conceptual introduction only) **6.3** Green building (Conceptual introduction only)	**7 Hrs**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2					1									
CO2	1	2				2									
CO3		1				2									
CO4	1	1													
CO5	2	1				1									
CO6	1				1										

References:

Text Books	
1	ding Construction" - B.C.Punmia, Laxmi Publications.
2	"Basic Civil Engineering" - G. K. Hiraskar, DhanpatRai Publications.
3	"A Text Book of Building Construction" - S.P. Arora, S.P. Bindra, Dhanpat Rai Publications.
4	"A Course in Civil Engineering Drawing" - V.B.Sikka, S.K.Kataria and Sons.
5	"Civil Engineering Drawing" - M. Chakraborty.

Reference Books	
1	"A to Z of Practical Building Construction and Its Management"- Sandeep Mantri SatyaPrakashan, New Delhi.
2	"Handbook of Building Construction" - M. M. Goyal (Amrindra Consultancy).
3	"Practical Handbook – Buiding baandhkam Va dekhrekh Part I and II", Pramod Beri, DIT publication, third edition. (Marathi Language).

Codes of standards:	
1	SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi.
2	I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings.

CE303T: APPLIED MATHEMATICS

Tutorials	:	1 Hr/Week	**Evaluation Scheme**	
Credit	:	1	**ISA** :	25 Marks

Course Objectives: The objective of the course is to

4. Develop mathematical skills and enhance thinking power of students.

5. Give the knowledge to the students of Linear Differential Equations, Vector Differential Calculus, Probability, Numerical methods of solving Algebraic and Transcendental equations with an emphasis on the application of solving engineering problems.

6. Prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

Course Outcomes:		
COs	**At the end of successful completion of the course, the student willbe able to**	**Blooms Taxonomy**
CO1	Solve Linear Differential Equation of higher order	Knowledge Understand
CO2	Make use of Linear Differential Equations to solve the Civil Engineering problems.	Apply
CO3	Use several methods of solving algebraic and transcendental equations of one variable.	Knowledge Apply
CO4	Calculate divergence, curl, gradient and directional derivative of a vector and scalar point function	Knowledge
CO5	Use Binomial, Poisson and Normal distributions to calculate probabilities	Apply
CO6	Describe the statistical data numerically by using Curve fittings.	Evaluation

Description:

Applied Mathematics course is offered as the basic science course. This course contains Mathematical methods and techniques that are used to solve complex Civil engineering problems. This course has six units namely i) Linear Differential equation, ii) Applications of Linear Differential Equations iii) Numerical Solution of Algebraic and Transcendental Equations iv) Vector Differential Calculus v) Probability Distribution and vi) Curve Fitting.

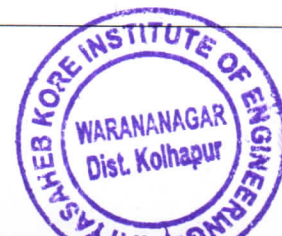| **Prerequisites:**	1:	Trigonometric identities and Logarithmic identities
	2:	Differentiation and integration formulae
	3:	Probability.

Tutorials	
S.N.	Title
1	Linear differential equations- Complementary Function
2	Linear differential equations- particular Integral
3	Applications of Linear differential equations
4	Numerical Solution of Algebraic and Transcendental Equations-Bisection method
5	Numerical Solution of Algebraic and Transcendental Equations- Secant method, Newton-Raphson method
6	Vector Differential Calculus-Gradient, Directional Derivatives
7	Vector Differential Calculus-Divergence, Curl
8	Probability Distribution- Binomial Distribution
9	Probability Distribution- Binomial Distribution
10	Curve Fitting

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1	--	--	--	--	--	---	--	--	--	--	--	--	--
CO2	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--
CO3	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--
CO4	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--
CO5	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--
CO6	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--

References:

Text Books	
1	Higher Engineering Mathematics, Dr. B. S. Grewal, S. Chand and Company, 40th Edition.
2	Advanced Engineering Mathematics, H. K. Das, S. Chand Publication, 8th Edition.
Reference Books	
1	Higher Engineering Mathematics, B. V. Ramana, Tata Mc Graw Hill, New Delhi
2	A Text Book of Applied Mathematics, Vol. I and II, P. N.Wartikar and J. N. Wartikar, Vidyarthi Griha Prakashan, Pune.
3	A textbook of Engineering Mathematics, N. P. Bali, Iyengar, Laxmi Publications (P) Ltd, New Delhi
4	Advanced Engineering Mathematics,Erwin Kreyszig, Wiley India Pvt. Ltd

CE305T – BUILDING CONSTRUCTION AND DRAWING LAB

Practicals: 2 hrs / week

**Credits:** 1

Examination Scheme:

ISA: 50 Marks

Course Objectives: The objective of the course is to
1. To understand different types of masonry work using stones, bricks, blocks. 2. To understand the various types of doors and windows with their components. 3. To understand the requirements of good stairs and design of stairs. 4. To understand Principles of Building planning. 5. To understand building bye laws and planning of Residential building.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Demonstrate different bonds in brick and stone masonry.	Understand
CO2	State and produce drawings of different building components.	Remember Apply
CO3	Design, Plan and draw different types of staircase.	Create Apply
CO4	State and explain principles of building planning and Bye-Laws.	Remember Understand
CO5	Design, Plan and draw residential building line plan.	Create Apply

Practicals:

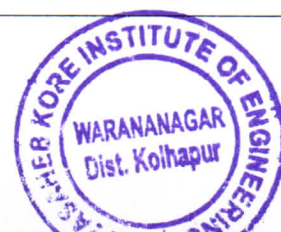| Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
	A. Sketch Book:		
1	Lettering, Symbols, Types of lines and dimensioning as per IS 962.	2	Remember Apply
2	Different types of Lintels and arches.	2	Remember Apply
3	Doors: Flush doors, Revolving door, Collapsible door and rolling shutter.	2	Remember Apply
4	Windows: Louvered window, Sliding Window, Bay window, Casement window, Dormer Window, Corner Window.	2	Remember Apply
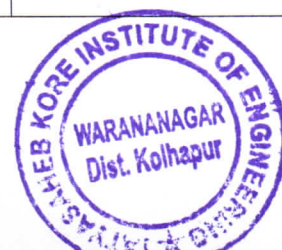
5	Stairs: Quarter turn, bifurcated, Spiral, Geometrical.	2	Remember Apply
6	Lifts, Ramps and escalators.	2	Remember Apply
7	Stone Masonry(Rubble and Ashlar), Brick masonry(English bond, Flemish bond) and Composite Masonry	2	Remember Apply
	B. Half Imperial Drawing Sheet		
1	Doors: T.W. Paneled Door.	2	Create Apply
2	Windows: Aluminum.	2	Create Apply
3	Stairs: Dog legged, quarter turn and Open well.	2	Create Apply
4	Line plans of Residential buildings (Bunglow, Twin Bungalow, Row house, Apartment)	4	Create Apply

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2					1									
CO2	1	2				2									
CO3		1				2									
CO4	1	1													
CO5	2	1				1									

References:

	Text Books
1	"Building Construction" - B.C.Punmia, Laxmi Publications.
2	"Basic Civil Engineering" - G. K. Hiraskar, DhanpatRai Publications.
3	"A Text Book of Building Construction" - S.P. Arora, S.P. Bindra, Dhanpat Rai Publications.
4	"A Course in Civil Engineering Drawing" - V.B.Sikka, S.K.Kataria and Sons.
5	"Civil Engineering Drawing" - M. Chakraborty.
	Reference Books
1	"A to Z of Practical Building Construction and Its Management"- Sandeep Mantri SatyaPrakashan, New Delhi.
2	"Handbook of Building Construction" - M. M. Goyal (Amrindra Consultancy).
3	"Practical Handbook – Buiding baandhkam Va dekhrekh Part I and II", Pramod Beri, DIT publication, third edition. (Marathi Language).
	Codes of standards:
1	SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi.
2	I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings.

CE306T – COMPUTER AIDED DRAWING LAB

Practicals: 2 hrs / week

Credits: 1

Examination Scheme:

ISA: 25 Marks

Course Objectives: The objective of the course is to
1. To learn basic 2D commands. 2. To develop plans for residential building. 3. To develop Municipal drawing & working drawings.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe Auto-CAD commands.	Remember
CO2	Draw 2D Auto-CAD drawing of residential building.	Remember Apply
CO3	Draw municipal drawings & working drawings.	Remember Apply

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
1	**Introduction to CAD** Basic commands to draw 2D objects like, point, line, circle, ellipse, polygon etc. Editing commands like, Erase, extension, break, trim, fillet, scale etc. Viewing commands like Zoom, pan, mirror, rotate, move, block, offsetting, Draw & Modify toolbars of any advance CAD Software.	6	Knowledge Apply
2	**Use of layers** Use of layers in 2D drawing, Annotation and Layers toolbars any advance CAD Software.	4	Apply
3	**Geometric Dimensioning and Tolerancing** Geometric Dimensioning and Tolerancing For 2-D Objects: Straightness, Flatness, Perpendicularity, Angularity, Roundness, Concentricity, Cylindricity, Run out, Profile, Parallelism etc. Entering limits, fits, tolerances surface finish symbols and Machining Symbols on drawings.	4	Apply
4	**Details of Municipal Drawing** Floor plans, Elevation, Sections, Location plan, Site plan, Block plans, Schedule of openings, Area statement, Construction notes etc.	4	Knowledge Apply

5	**Details of Working Drawings** Centre line drawing, Furniture details, Electrification drawing, Plumbing drawing	6	Knowledge Apply

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2				2										
CO2	1				2										
CO3					1										

References:

Reference Books	
1	"AutoCAD" – David Frey,BPB Sybex Publications.
2	"AutoCAD"– George Omura.

CE307T- NUMERICAL METHOD

Practical	:	2 Hrs/Week	**Evaluation Scheme**		
Credit	:	1	ISE	:	25 Marks
			ESE	:	--

Course Objectives: The objective of the course is to
1. Study the Numerical methods for evaluating definite integrals. 2. To learn fitting of straight lines and parabola. 3. To introduce the concept of Linear Programming Problem. 4. To understand methods of solution of partial differential equations.

Course Outcomes:		
COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Identify, classify and choose the most appropriate numerical method for solving aproblem.	Knowledge Understand
CO2	Illustrate basic theory of correlation and regression.	Understand
CO3	Understand and solve Linear Programming Problem.	Understand
CO4	Interpret the methods of solutions to solve classical problems.	Understand

Description:
To explore complex systems, physicists, engineers, financiers and mathematicians require computational methods since mathematical models are only rarely solvable algebraically. Numerical methods, based upon sound computational mathematics, are the basic algorithms underpinning computer predictions in modern systems science. Such methods include techniques for simple optimization, interpolation from the known to the unknown, linear algebra underlying systems of equations, ordinary differential equations to simulate systems, and stochastic simulation under random influences.

Prerequisites:	1:	Newton's forward and backward formulae
	2:	Euler's Equation
	3:	Solution of Laplace equation

		Section – I	
		Numerical Differentiation and Integration:	
Unit 1	Newton's forward and backward formulae. Lagrange's interpolation formula. Trapezoidal Rule. Simpson's $1/3^{rd}$ and $3/8^{th}$ rules Gradient of scalar point function and directionalderivative.		**3 Hrs**
		Curve Fitting and Partial Differential Equations:	
Unit 2	Correlation and regression. Fitting of curves by methods of least squares (straight-line and parabola). Laplace equation		**3 Hrs**
		Section – II	
		Linear Programming:	
Unit 3	**Types of solutions to linear programming problems.** Simplex method to solve Linear Programming Problem. Formation of L.P.P.		**3 Hrs**
		Calculus of variation:	
Unit 4	Introduction and definition. Euler's Equation Isoperimetric problem		**3 Hrs**

Practicals:

- Batch wise Practical's are to be conducted. The number of students per batch shouldbe as per University pattern for practical batches.
- Programs on applications to civil engineering problems using C and C++ Language

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
1	Trapezoidal Rule	2	Apply
2	Simpson's $1/3^{rd}$ rule.	2	Knowledge Apply
3	Simpson's $3/8^{th}$ rule.	2	Apply
4	Newton's forward formula.	2	Knowledge, Analyze
5	Solution of Laplace equation	2	Knowledge
6	Linear Programming Problem by simplex method.	2	Analyze
7	Euler's Equation	2	Analyze
8	Least squares (straight-line and parabola).		

*Minimum number of practical should be 6 covering all topics.

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1	2	-	-	1	--	--	---	--	--	--	--	--	--	--
CO2	1	-	-	-	-	--	--	--	--	--	--	--	--	--	--
CO3	1	2	-	2	-	--	--	--	--	--	--	--	--	--	--
CO4	1		-	2	2	--	--	--	--	--	--	--	--	--	--

References:

Text Books	
1	A text book of Applied Mathematics, Vol.I by P. N. Wartikar & J. N. Wartikar, Pune, Vidyarthi Griha Prakashan, Pune.
2	Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi.
3	A text book of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd., New Delhi.
Reference Books	
1	Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
2	Advanced Engineering Mathematics by H. K. Dass, S. Chand, New Delhi.
3	A text book of Engineering Mathematics Volume I by Peter V. O'Neil and Santosh K.Sengar, Cengage Learning.
4	Mathematical methods of Science and Engineering by Kanti B. Datta, CengageLearning.

CE301P – STRENGTH OF MATERIALS LAB

Practicals: 2 hrs / week
Credits: 1

Examination Scheme:
ISA: 25 Marks
POE: 25 Marks

Course Objectives: The objective of the course is to
1) To familiarize the students with the use equipments to determine mechanical properties of materials to acquire the knowledge in Material Testing. 2) To familiarize the students with various Types of load and material behaviour.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Determine different properties like strength, elongation, toughness, hardness by doing tests like Tensile test, Impact test, Hardness test.	Knowledge, Apply
CO2	Understand Behavior of Member under different loading conditions	Analyze
CO3	Determine load carrying capacity of different material	Analyze
CO4	Explain the concept of Hardness and strain energy	Understand Analyze

Practicals:

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
1	Study of Universal testing machine	2	Apply
2	Tensile test on Mild steel.	2	Knowledge Apply
3	Compression test on mild steel	2	Apply
4	Double Shear test of on mild steel	2	Knowledge, Analyze
5	Water absorption and compressive strength of burnt brick	2	Knowledge
6	Study of Impact testing (Izod and Charpy) on Mild Steel.	2	Analyze
7	Hardness testing (Brinell) on Mild steel, Alluminium and brass	2	Analyze

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1	1	1	--	--	--	---	--	--	---	--	--	---	--
CO2	2	1	2	2	--	--	--	---	--	--	---	--	--	---	--
CO3	--	2	2	--	--	--	--	---	--	--	---	--	--	---	--
CO4	--	2	--	--	--	--	--	---	--	--	---	--	--	---	--

References:

Text Books	
1	"Strength of Materials" - R.K.Bansal., Laxmi Publications.
2	"Strength of Materials" - S Ramamrutham, DhanapatRai Publications.
3	"Structural Analysis" - Bhavikatti S.S, Vikas Publications house New Dehli.
Reference Books	
1	"Mechanics of Materials" - Gere and Timoshenko, CBS publishers.
2	"Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
3	"Mechanics of Material" - Beer and Johnston, M.

CE302P – SURVEYING LAB

Practicals: 2 hrs / week
Credits: 1
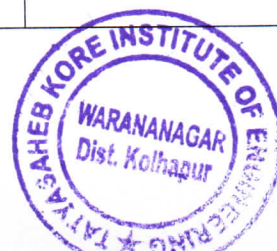
Examination Scheme:
ISA: 50 Marks
POE: 25 Marks

Course Objectives: The objective of the course is to
1. To obtain a full understanding of the methods of measurement, errors to be expected, and their control
2. To know the basics of levelling and theodolite survey in elevation and angular measurements
3. To find out area and volumes using various instruments
4. To study the significance of plane table surveying in plan making

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Take linear and angular measurements	Knowledge, Apply
CO2	Record various measurements in the field book	Analyze
CO3	Find areas of irregular figures by using mathematical formulas and Planimeter	Apply, Analyze
CO4	Carry out traversing to fill interior details by plane table survey and theodolite	Understand Analyze

Practicals:

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
1	Differential and reciprocal levelling, by Auto or Dumpy Level	4	Understand, Apply
2	Two Peg Method	2	Knowledge Apply
3	Sensitivity of bubble tube	2	Understand, Apply
4	Methods of plane table survey – any two methods	4	Knowledge, Analyze
5	Measurement of horizontal angles by any two methods	4	Knowledge, Analyze
6	Trigonometrical levelling- when base is accessible.	2	Analyze

7	Project drawings
	  a) Block contouring project for at least 100m x 100m- By Auto Level.
	  b) Theodolite traverse – Pentagon
		2	Understand, Analyze

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1	1	1	--	--	--	---	--	--	---	--	--	---	--
CO2	2	1	2	2	--	--	--	---	--	--	---	--	--	---	--
CO3	--	2	2	--	--	--	--	---	--	--	---	--	--	---	--
CO4	--	2	1	1	--	--	--	---	--	--	---	--	--	---	--

References:

| Text Books	
1.	Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni, Pune arthi Griha Prakashan
2.	Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain, Laxmi cations.
3.	Surveying and Levelling by N. N. Basak, Tata McGraw Hill
4.	Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill
5.	Surveying and Levelling - R. Agor, Khanna Publishers, New Delhi
Reference Books	
1.	Principles of Surveying. Vol. I by J. G. Olliver, J. Clendinning - Van Nostrand Reinhold
2.	Plane Surveying by A. M. Chandra, New Age International Publishers
3.	Surveying Vol. I & II by Dr. K. R. Arora, Standard Book House
4.	Plane surveying – David Clark.

CE304P – FLUID MECHANICS LAB

Practicals: 2 hrs / week
Credits: 1

Course Objectives: The objective of the course is to
1) To study processes and science of fluid and their properties.
2) To study pressure measuring devices and pressure diagram.
3) To apply basic principles in fluid flow problems.   4) To identify the losses in pipes.

Course Outcomes:		
COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Study the basic properties of fluids and their behavior under application of various force systems.	Knowledge Understand
CO2	Discuss the basic concepts and principles in fluid statics, fluid kinematics and fluid dynamics with their applications in fluid flow problems.	Understand
CO3	Recognize the principles of continuity, momentum and energy as applied to fluid in motion.	Understand
CO4	Apply the equations to analyze problems by making proper assumptions and learn systematic engineering methods to solve practical fluid mechanics problems	Apply Evaluate

Practicals:

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
1	Measurement of Discharge.	2	Apply
2	Study of Pressure Measuring Devices.	2	Knowledge Apply
3	Determination of Metacentric Height for Floating Bodies.	2	Apply
4	Verification of Bernoulli's Theorem.	2	Knowledge, Analyze
5	Calibration of Venturimeter.	2	Knowledge
6	Calibration of Orificemeter.	2	Analyze
7	Determination of Hydraulic Coefficients of Orifice.	2	Analyze
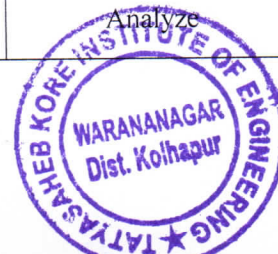
8	Reynold's Experiment.	2	Knowledge, Analyze
9	Determination of Friction Factor for Given Pipe.	2	Analyze
10	Determination of Minor Losses in a Given Pipe.	2	Analyze
11	Study of Moody's Chart.	2	Analyze

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1	2		1		2	--	---	--	--	--	--	--	--	--
CO2		2	1	2		1	--	--	--	--	--	--	--	--	--
CO3	2	1		1		--	--	--	--	--	--	--	--	--	--
CO4		2			1	1	--	--	--	--	--	--	--	--	--

References:

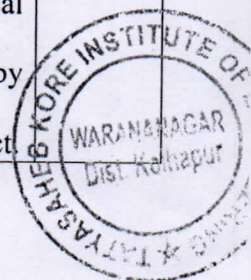| Text Books	
1	Mechanics – A.K. Jain – Khanna Pub., Delhi.
2	Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi/Seth – Standard Book House, Delhi.
3	Fluid Mechanics and hydraulic machine-R.K.Bansal, Laxmi Pubication.
4	Fluid Mechanics – Garde-Mirajgaonkar – Nemchandand Bros., Roorkee.
5	Fluid Mechanics – S. Nagrathanam – Khanna Pub., Delhi.
Reference Books	
1	Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland.
2	Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd. Tokyo.
3	Fundamentals of Fluid Mechanics, Munson, Young, Okiishi, Huebesch, Wiley Publication
4	Fluid Mechanics – Shames - McGraw-Hill International Book Co., Auckland

CE 309A – ENVIRONMENTAL STUDIES

Lectures	:	2 Hrs/Week	Evaluation Scheme		
Credit	:		TW	:	40 Marks
Tutorials	:	---	ESE	:	60 Marks

Course Objectives: The objective of the course is to
The syllabus of Environmental Studies provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students of Engineering undergoing this course would develop a better understanding of human relationships, perceptions and policies towards the environment and focus on design and technology for improving environmental quality. Their exposure to subjects like understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management and the effects of global climate change, shall help the students to bring a systems approach to the analysis of environmental problems.

Course Outcomes:		
COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Relate the interdependency of environmental components.	Knowledge Understand
CO2	Identify the environmental problems and prevent environmental pollution	Understand
CO3	Interpret impacts of waste on environmental components.	Understand
CO4	Analyze environmental change and its social impacts	Understand

Prerequisites:	1:	Understanding of Environment Education course.

Section – I		
Unit 1	**Ecology:** Ecosystem, Ecological Pyramids, Food chain, food web, Ecological succession, Natural Resources and Associated Problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources Role of individuals in conservation of natural resources.	4 Hrs
Unit 2	**Environmtal Pollution:** **Water pollution:** causes, effects, control, drinking water quality standards, Arsenic, lead, cadmium, chromium, fluoride contamination & its effects, water treatment, wastewater treatment **Air pollution:** Causes, effects, control, Air pollution controlling equipments, Air quality standards, National air quality index, vehicular emission, alternative fuels, indoor air pollution, Thermal inversions, Photochemical Smog and Acid Precipitation **Noise pollution:** Causes, effects, control, noise standards recommended by CPCB, Environmental Protection Act, Air (Prevention and Control of Pollution) Act	10 Hrs

		Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act and International and National efforts for Environmental Protection.	
		Section – II	
		Waste management:	
Unit 3		Solid waste management, biomedical waste management, E waste, plastic waste management, Hazardous waste management, carbon footprint, Recycling of waste, Role of Central Pollution Control Board (CPCB),State Pollution Control Board, Role of NGO's	**4 Hrs**
		Social Issues and Environment:	
Unit 4		Global Warming, Ozone layer depletion, urban problems related to energy, Alternative energy sources, Evolution of Sustainable development: timeline, Evolution of green movements in India, Disaster management: Flood, Earthquakes, Cyclones, Landslides, Draught, Tsunami etc., Swachh Bharat Mission, Role of Information technology in Environment and human health.	**6 Hrs**

Project Work:

Visit to Local Polluted site –Urban/Rural/Industrial/Agricultural

Or

Study of simple Ecosystems –Ponds, River, Hill slopes

Or

Preparation of small models or device to resolve the environment problem/issue

Project work shall be based on programme

Evaluation Guideline:

- This course is non-credit Audit Course and at the end of semester, course exam will be conducted as per the guidelines received from Institute. Exam will be of 60 marks for Theory Paper and 40 marks for project report and same is to be converted in audit points by the programme.
- Each group of Project should consist of maximum 4-5 students.
- Project work shall be based on programme
- The project will be evaluated by respective branch HOD and project guide and senior faculty.
- There should be a presentation of project before the committee and a hard copy is to be submitted.

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1						--	--	---	--	--	--	--	--	--	--
CO2						--	--	--	--	--	--	--	--	--	--
CO3						--	--	--	--	--	--	--	--	--	--
CO4						--	--	--	--	--	--	--	--	--	--
CO5						--	--	--	--	--	--	--	--	--	--
CO6						--	--	--	--	--	--	--	--	--	--

References:

Text Books	
1	Agarwal K.C. ,2001 "Environmental Biology", Nidi publication ltd., Bikaner
2	D.K.Asthana, Meera Asthana, A Textbook of Environmental Studies, S. Chand Publication Revise edition,2006.
3	**S. Deswal & A. Deswal, Basic course in environmental Studies, Dhanpat Rai Co ltd., Delhi, Second revised edition, 2009.**
Reference Books	
1	Eldon D Enger, Bradley F. Smith, Environmental science – a study of inter- relationships Wm C Brown Publishers 1989
2	Francois Ramade Ecology of Natural resources, John wiley & Sons, 2009
3	Robert Leo Smith, Ecology and field biology, Harper Collins Publishers, 1998
4	Gilbert M. Masters, Introduction to Environmental Engineering & Science, Prentice Hall International Inc. Second Edition

Second Year B. Tech.
Civil Engineering

Second Semester Detailed Syllabus

CE401-MECHANICS OF STRUCTURES

Lectures	:	3 Hrs/Week	**Evaluation Scheme**
Credit	:	3	ISE : 40 Marks
Tutorials	:	---	ESE : 60 Marks

Course Objectives: The objective of the course is to

1. Introduction to structural systems, and to methods of analyzing these systems under various loading conditions.
2. To understand behavior of structure under combined loading.
3. To analyze the structures subjected to moving loads.

Course Outcomes:		
COs	At the end of successful completion of the course, the student will be able to	**Blooms Taxonomy**
CO1	Evaluate the state of stress at a point due to combined effect essential of different forces acting on a structural member hence to calculate the maximum and minimum direct and shear stresses.	Knowledge Understand
CO2	Analyze how to superimpose the actions like normal force, shear force bending moment and hence to know the combined effect of these actions on the members.	Understand
CO3	Understand the location a section experiencing the maximum effect due to moving loads on it.	Understand
CO4	Interpret the change in behavior of column due to changes in end conditions and dimensions of the column.	Understand
CO5	Apply the basic methods used to trace the deformed shape of the flexural member.	Apply Evaluate
CO6	Exhibit combined effect of moment, torque and axial thrust, variation in stress distribution and nature of failure due torque.	Apply

Description:

Life of the Civil Components is greatly influenced by the Load and material properties So analysis of load and mechanical properties identification is very important task to select the appropriate material, One should know about required properties for specified task. This course deals with different engineering material and their properties. And several analysis methods

Prerequisites:	1:	Basics of Engineering Mechanics
	2:	moment Calculation and Basic concept of stress
	3:	Moment of Inertia and Method of section

Section – I
Principal planes & stresses:

Unit 1	Normal and shear stresses on any oblique plane. Concept of principal planes and stresses by analytical method & introduction to graphical methods (Mohr'scircle of stress 2-D). Theories of failure: Maximum normal stress, maximum shear stress and maximumstrain energy theory.	6 Hrs
	Combined direct and bending stresses:	
Unit 2	Concept of Combined direct and bending stresses eccentric load, core /kernel of section. Stability analysis of gravity dam, Analysis of retaining wall, Analysis of chimney under wind pressure.	6 Hrs
	Influence line diagrams:	
Unit 3	Introduction to Influence line diagram, Muller's Breslau's principle & its applications to statically determinate simple and compound beam.	6 Hrs
	Section – II	
	Buckling of long columns:	
Unit 4	Fundamentals of Critical load and buckling, Effective length for various end conditions. Slenderness ratio, Safe load on column. Euler's theory and its limitation, Rankine's theory.	6 Hrs
	Slope and deflection of determinate beams:	
Unit 5	Basic concept of slope and deflection, Slope and deflection of determinate beam with Double integration method, Macaulay's method, Moment-Area method & Conjugate beam method.	6 Hrs
	Torsion of circular shaft:	
Unit 6	Analysis of circular shaft subjected to torsion. Power transmitted to circular shaft. Shafts subjected to combined bending, torsion & axial thrust.	6 Hrs

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1	2			1	--	--	---	--	--	--	--	--	--	--
CO2	1	2	1	2		--	--	--	--	--	--	--	--	--	--
CO3	1	2				--	--	--	--	--	--	--	--	--	--
CO4			2	2	2	--	--	--	--	--	--	--	--	--	--
CO5	1	2	1			--	--	--	--	--	--	--	--	--	--
CO6	1	2			1	--	--	--	--	--	--	--	--	--	--

References:

	Text Books
1	ngth of Materials" - R.K.Bansal., Laxmi Publications.
2	"Strength of Materials" - S Ramamrutham, DhanapatRai Publications.
3	"Structural Analysis" - Bhavikatti S.S, Vikas Publications house New Dehli.
4	"Strength of Materials" - R.K.Rajput., S.Chand Publications.
	Reference Books
1	"Mechanics of Materials" - Gere and Timoshenko, CBS publishers.
2	"Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
3	"Mechanics of Material" - Beer and Johnston, M.

CE402- ADVANCED SURVEYING

Lectures	:	3 Hrs/Week	Evaluation Scheme		
Credit	:	3	ISE	:	40 Marks
Tutorials	:	---	ESE	:	60 Marks

Course Objectives: The objective of the course is to

1. To understand tacheometric surveying in distance and height measurements.
2. To get introduced to different geodetic methods of survey such as triangulation.
3. To get introduced to modern advanced surveying techniques involved such as remote sensing, Total station, GPS, drone survey, Photogrammetry etc.
4. To understand the elements of different types of curves and preliminary survey for road.

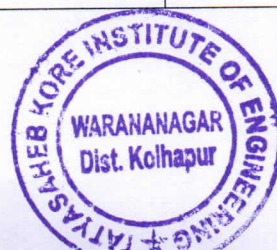| Course Outcomes:		
COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Adopt the principles of advanced surveying` instruments	Knowledge Understand
CO2	Formulate triangulation stations, flight planning and ground control points	Knowledge Understand
CO3	Apply GIS, GPS and arial photogrammetry concepts to civil engineering problems.	Understand and Apply
CO4	Demonstrate the ability to work on modern techniques coming in the civil engineering industry.	Knowledge Understand Apply
CO5	Evaluate the setting out of various curves	Apply

Description:
Application of Theodolite Surveying – Tacheometry, Height & distance, Curve setting problems (Compound, Reverse & Transition). Advance methods of surveying such as Total station, GIS, GPS, Drone survey is an important parameter required for surveying.

Prerequisites:	1:	Levelling
	2:	Theodolite traversing
	3:	Distance measurements

Section – I

	Measurement of distances and elevations	
Unit 1	Tachometry – Principles, Suitability, Methods Stadia diaphragm, Stadia formulae. Tachometric contouring	7 Hrs

Unit 2	**Geodetic Surveying**	
	Triangulation Principle and Classification, system, Selection of station, Base line, Measurement. Correction and use of sub tense bar. Signals, satellite station, Reduction to center, Trilateration	7 Hrs
Unit 3	**Modern Surveying Equipment's and Project Surveys**	
	Principle of EDM, Use and applications of Total Station. Reconnaissance, Preliminary and Detailed survey for road project.	4 Hrs
	Section – II	
Unit 4	**Photogrammetry**	
	Types of photogrammetry, Terrestrial Photogrammetry- introduction only. Aerial photogrammetry – Scale of vertical photographs, Flight planning, **Introduction to Drone survey.**	5 Hrs
Unit 5	**Curves**	
	Significance of curves and curve setting. Type of horizontal curve, elements of Simple, Compound curve, Transition curve introduction only, setting out of simple curve by linear and angular methods. Vertical curves – types, lengths of vertical curves	7 Hrs
Unit 6	**Modern methods of surveying**	
	Remote sensing – Definition, relevance, types, electromagnetic radiation and energy sources and its characteristics, applications to civil engineering. GPS – basic principles, applications in survey, DGPS GIS – Terminology, advantages, basic components of GIS, data types, GIS analysis, applications of GIS software,	6 Hrs

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1	2		2	2	--	--	---	--	--	--	--	--	--	--
CO2	1	2			1	--	--	--	--	--	--	--	--	--	--
CO3	1	1	2		1	--	--	--	--	--	--	--	--	--	--
CO4		1	1	2	1	--	--	--	--	--	--	--	--	--	--
CO5	1	2	2		1	--	--	--	--	--	--	--	--	--	--

References:

Text Books
1. **Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni, Pune** arthi Griha Prakashan
2. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain, Laxmi cations.
3. Surveying and Levelling by N. N. Basak, Tata McGraw Hill
4. Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill
5. Surveying and Levelling - R. Agor, Khanna Publishers, New Delhi
Reference Books
1. Principles of Surveying. Vol. I by J. G. Olliver, J. Clendinning - Van Nostrand Reinhold
2. Plane Surveying by A. M. Chandra, New Age International Publishers
3. Surveying Vol. I & II by Dr. K. R. Arora, Standard Book House
4. Plane surveying – David Clark.

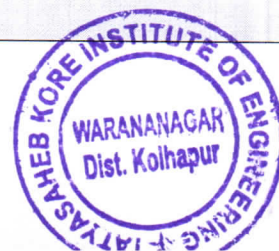# CE403- CONCRETE TECHNOLOGY

Lectures	:	3 Hrs/Week	**Evaluation Scheme**		
Credit	:	3	ISE	:	40 Marks
Tutorials	:	---	ESE	:	60 Marks

Course Objectives: The objective of the course is to

1. To study materials used in concrete production.
2. To understand process of concrete manufacturing and to study properties of fresh concrete.
3. To study relationship between compressive strength and tensile strength.
4. To study mix design of concrete by using IS code method and ACI method
5. To study different Chemical Admixtures
6. To study different types of special concrete and their manufacturing.

Course Outcomes:		
COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Impart knowledge of physical properties of ingredients of concrete and their effect on strength and durability.	Knowledge Understand
CO2	Explain the fundamentals of process of making good quality concrete and its elastic properties.	Understand Apply Evaluate
CO3	Understand the factors affecting properties of concrete.	Understand Evaluate
CO4	Design the concrete mix proportion as per Indian standard code of practice.	Evaluate
CO5	Demonstrate Non Destructive Testing (NDT) and evaluate quality of existing concrete.	Apply Evaluate
CO6	Understand different types of concrete and their applications.	Knowledge Apply

Description:
Life of the Civil Components is greatly influenced by the Load and material properties So analysis of load and mechanical properties identification is very important task to select the appropriate material, One should know about required properties for specified task. This course deals with different engineering material and their properties. And several analysis methods

Prerequisites:	1:	Basics civil engineering
	2:	Building Construction & Drawing

Section – I

	Ingredients of concrete:	
Unit 1	**Cement**: Manufacturing process of cement, chemical composition, grades of cement, hydration, types of cement, Tests for cement: fineness, Standard consistency, setting time, soundness and compressive strength. **Aggregates**: classification, requirements, Tests for coarse aggregates: specific gravity, grading of aggregate, Flakiness index, Elongation Index, Impact value, abrasion value, crushing value. Tests for fine aggregates: specific gravity, sieve analysis, fineness modulus. Alkali aggregate reaction, bulking of sand, Artificial and Recycled aggregate. **Water**: general requirements, quality of water	7 Hrs
	Workability:	
Unit 2	Factors affecting, different tests for measurement of workability. Segregation, bleeding. Manufacturing process of concrete: batching, mixing, transportation, compaction, curing of concrete, curing methods.	6 Hrs
	Hardened concrete :	
Unit 3	Strength of concrete: w/c ratio, gel/space ratio, gain of strength with age, maturity concept of concrete, effect of maximum size of aggregate on strength. Test on hardened concrete: compressive strength, comparison of compressive strength between cube test and cylinder test, flexural strength. Relation between compressive and tensile strength. Elastic constants, factors affecting modulus of elasticity, definition and factors affecting creep and shrinkage. Nondestructive testing: Schmidt's rebound hammer, Ultrasonic pulse velocity method.	8 Hrs
	Section – II	
	Concrete Mix Design :	
Unit 4	Objectives of mix design, different methods of mix design, factors affecting mix proportions, quality control of concrete, statistical methods, acceptance criteria, Numerical on mix design by ACI 211.1-1991, IS 10262- 2009 and IS 456 -2000. Mix design of fly ash concrete by IS 10262 – 2009.	8 Hrs
	Admixtures in concrete:	
Unit 5	**Chemical Admixtures:** Plasticizers, Super plasticizers, Retarders, Air entraining agents, IS 9103Specifications **Mineral Admixtures**: Fly ash, Silica Fume, GGBS, Rice husk ash, metakaolin	5 Hrs
	Special Concretes and Durability of concrete:	
Unit 6	**Special Concretes**: Light weight concrete, Polymer modified concrete, concept of fibre reinforced concrete, High performance concrete, Pumpable concrete, Roller compacted concrete, Self compacting concrete, Decorative concrete. **Durability of concrete**: Significance, Permeability and Durability, Chemical Attack, Sulphate attack, Attack by Seawater, Acid attack, Chloride attack, Carbonation of concrete and its determination.	6Hrs

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1			1		1	1	---	--	--	--	--	--	--	--
CO2			1	2		2	2	--	--	--	--	--	--	--	--
CO3			1	1		1	--	1	--	--	--	--	--	--	--
CO4		1	2	2	2	2	--	--	--	--	--	--	--	--	--
CO5	2		1		1	1	1	2	--	--	--	--	--	--	--
CO6	1				2	2	--	2	--	--	--	--	--	--	--

References:

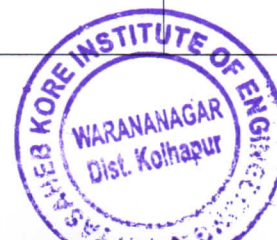|	Text Books
1	Shetty, M.S., Concrete Technology, S. Chand Publication.
2	Gambhir, M.L., Concrete Technology, Tata McGraw Hill.
	Reference Books
1	A. M. Neville, J. J. Brooks, "Concrete Technology" Pearson Education India
2	A. M. Neville, "Properties of Concrete", Pearson Education India.
3	R.S. Varshney, "Concrete Technology", Oxford and IBH.
4	P. Kumar Mehta, "Microstructure and properties of concrete", Prentice Hall.SP-26.

CE404-HYDRAULICS

Lectures	:	3 Hrs/Week	**Evaluation Scheme**		
Credit	:	3	**ISE**	:	40 Marks
Tutorials	:	---	**ESE**	:	60 Marks

Course Objectives: The objective of the course is to

1.	To study uniform and non-uniform flow in open channel.
2.	To study velocity and discharge measurement devices.
3.	To study impact of jet, Pumps and turbines.

Course Outcomes:		
COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Provide students with basic knowledge of fluid properties and utilizing principles developed in fluid mechanics	Knowledge Understand
CO2	Develop the principle and equation for pressure flow and momentum analysis.	Understand
CO3	Provide the students with the analytical knowledge of pressure and velocity distribution in an open channel in order to solve practical problems	Understand
CO4	Illustrate and develop the equations and design principles for open channel flows, including sanitary and storm sewer design and flood control hydraulics.	Apply Evaluate

Description:

Without Fluid survival of Living Organism is highly impossible. Whole Engineering sector is greatly influenced by Fluid. Fluid Mechanics helps to understand the behavior of fluid under various forces and at different atmospheric conditions, and to select proper fluid for various applications. In this course students will learn about fundamentals, properties, principles and governing equations of fluid behavior in statics and in motion. Students willget new problem solving approaches like control volume concept, streamline patterns and fluid flow analysis. This course has six units namely i) Fluid Properties ii) Fluid Statics iii) Fluid Kinematics iv) Fluid Kinetics v) Laminar and turbulent Flow v) Losses in pipes

Prerequisites:	1:	Applied Mechanics
	2:	Engineering Mathematics
	3:	Engineering Physics
	4:	Basic Civil Engineering

Section – I

	Uniform Flow in Open Channel:	
Unit 1	A. Introduction, Types of Open Channels, Types of Flows in Open Channel, Geometric Elements, Velocity Distribution, Measurement of Velocity- (Pitot tube, Current Meter) B. Steady and Uniform Flow: Characteristics of uniform flow, Chezy's and Manning's Formula, Uniform Flow Computations, Hydraulically Efficient Section (Rectangular, Triangular, Trapezoidal)	**4Hrs**

Unit 2	**Gradually Varied Flow (GVF):** Depth Energy Relationship in Open Channel Flow: Specific Force (Definition and Diagram) **Gradually Varied Flow (GVF):** Definition, Classification of Channel Slopes, Dynamic Equation of GVF (Assumption and Derivation), Classification of GVF Profiles, Practical Examples.	**4Hrs**
Unit 3	**Rapidly Varied Flow (RVF):** Rapidly Varied Flow (RVF): Definition, Hydraulic Jump- Phenomenon, Conjugate Depth Relationship, Characteristics, Hydraulic Jump (uses, types, location and application) ,Hydraulic Jump as an Energy Dissipater, Surges in open channel-Positive and Negative Surge.	**4Hrs**
	Section – II	
Unit 4	**Notches and Weirs:** Types, Derivation of Discharge Equation, Velocity of Approach, Francis Formula, Calibration of Notches. Sharp, Broad and Round Crested Weirs, Calibration of Weir, Time of Emptying Tank with Weir.	**4Hrs**
Unit 5	**Impact of Jet :** Impulse Momentum Principle, Impact of Jet on Vanes- Flat, Curved (Stationary and Moving), Inlet and Outlet Velocity Triangles, Series of Flat, Curved Vanes Mounted on Wheel.	**3Hrs**
Unit 6	**Pumps and Turbines:** A. Hydraulic Turbines: Classification of Turbines- Pelton, Francis and Kaplan Turbine Selection of Type of Turbine, Concept of Draft Tube. B. Centrifugal Pump: Classification, Performance Characteristics, Common Pump Troubles and Remedies, Net Positive Suction Head (NPSH).	**5Hrs**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1	2				2	--	---	--	--	--	1	--	--	--
CO2		1	2		1	2	--	--	--	--	--	--	--	--	--
CO3	2	1		1		--	--	--	--	--	--	1	--	--	--
CO4		2		2	1	1	--	--	--	--	--	--	--	--	--

References:

	Text Books
1	Mechanics – A.K. Jain – Khanna Pub., Delhi.
2	Open Channel flow – Rangaraju – Tata McGraw-Hill Pub. Co., Delhi.
3	Fluid Mechanics – K. Subramanyam – Tata McGraw-Hill Pub. Co., Delhi.
4	Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi / Seth – Standard Book House, New Delhi.
5	Fluid Mechanics and hydraulic machine-R.K.Bansal, Laxmi Pubication.
	Reference Books
1	Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland.
2	Flow in open channel – V. T. Chaw - McGraw-Hill International Book Co., Auckland.
3	Fluid Mechanics – K. L. Kumar – Eurasia Publication House, Delhi.

CE405 - BUILDING PLANNING AND DESIGN

				Evaluation Scheme	
Lectures	:	3 Hrs/Week			
Credit	:	3	ISE	:	40 Marks
Tutorials	:	---	ESE	:	60 Marks

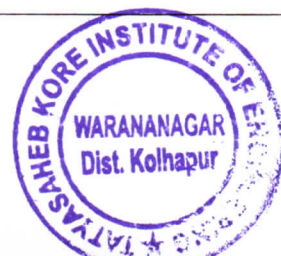| Course Objectives: The objective of the course is to |
|---|
| 1. To study Planning, designing of various public buildings considering principles of planning and Building Bye- Laws and regulations.
2. To study procedures for preparing perspective drawings of various objects.
3. To study Architectural composition and terms.
4. To understand preparation of submission drawings in standard format.
5. To understand various building services such as plumbing, electrification, Air conditioning, fire resistance, thermal insulation.
6. To understand various building finishes. |

Course Outcomes:		
COs	**At the end of successful completion of the course, the student will be able to:**	**Blooms Taxonomy**
CO1	Plan, design public building considering principles of planning and Building Bye- Laws and regulations.	Create Apply
CO2	Illustrate the procedures for preparing perspective drawings of various objects.	Analyze
CO3	Apply knowledge of architectural composition and terms for betterment of aesthetic view.	Apply
CO4	Prepare the submission drawing of residential building.	Create Apply
CO5	Illustrate the concepts of plumbing, electrification, ventilation, air conditioning and thermal insulation.	Analyze
CO6	Describe different types of building finishes.	Remember

Description:
Civil engineering deals with development of different Infrastructures. Building Construction is one of the important sectors in Infrastructure development. Planning and designing of public building requires understanding and apply concepts of site selection criterions, principles of building planning, byelaws, rules and regulations etc. For effective working, structure requires different building services and finishes.

Prerequisites:	1:	Knowledge of principles of building planning and byelaws.
	2:	Line plan development of residential building.
	3:	Technical Drawing Concepts.

	Section – I	
Unit 1	Site selection, site layout, planning and design of various types of public building such as: **1.1** Educational Buildings **1.2** Building for Health **1.3** Assembly Buildings **1.4** Business and Mercantile Buildings **1.5** Office Buildings	**10 Hrs**
Unit 2	Perspective Drawings **2.1** Elements of perspective drawings **2.2** Parallel perspective and angular perspectives of simple objects.	**6 Hrs**
Unit 3	**3.1** Architectural composition and terms such as mass, space, proportion, symmetry, balance, contrast, pattern	**2 Hrs**
	Section – II	
Unit 4	**4.1** Plumbing system: Various Materials for system like U-PVC, C-PVC, GI, and HDPE. Various types of traps, Fittings, Chambers, Need of Septic Tank, Concept of Plumbing and Drainage plan, introduction to rainwater harvesting. **4.2** Electrification: Concealed and Open Wiring, Requirements and Location of various points, Concept of Earthing. **4.3** Fire resistance in building: Fire protection precautions, confining of fire, fire hazards, Characteristics of fire resisting materials, building materials and their resistance to fire.	**6 Hrs**
Unit 5	**5.1** Ventilation: Definition and necessity of Ventilation, functional requirement, various system and selection criteria. **5.2** Air conditioning: Purpose, Classification, Principles, Systems and Various Components of the same. **5.3** Thermal Insulation: General concept, Materials, Methods. **5.4** Introduction to Acoustics: Absorption of sound, various materials, conditions for good acoustics. **5.5** Sound Insulation: Methods of noise control.	**7 Hrs**
Unit 6	**6.1** Paints: Different types and application methods. **6.2** Plastering and Pointing: various types. **6.3** Wall cladding: Skirting, dado work with various materials. **6.4** Miscellaneous finishes: POP, Gypsum plaster	**5 Hrs**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1				2									
CO2	1									2					
CO3	1														
CO4	2	1				2				1					
CO5		2				1									
CO6						1									

References:

	Text Books
1	"Building Drawing with an integrated approach to Built-Environment" - Shah, Kale and Patki, Tata Mcgraw Hill publication
2	ding Construction" - B.C.Punmia, Laxmi Publications.
3	"Basic Civil Engineering" - G. K. Hiraskar, DhanpatRai Publications.
4	"A Text Book of Building Construction" - S.P. Arora, S.P. Bindra, Dhanpat Rai Publications.
5	"A Course in Civil Engineering Drawing" - V.B.Sikka, S.K.Kataria and Sons.
6	"Civil Engineering Drawing" - M. Chakraborty.
	Reference Books
1	"A to Z of Practical Building Construction and Its Management"- Sandeep Mantri SatyaPrakashan, New Delhi.
2	"Handbook of Building Construction" - M. M. Goyal (Amrindra Consultancy).
3	"Practical Handbook – Buiding baandhkam Va dekhrekh Part I and II", Pramod Beri, DIT publication, third edition. (Marathi Language).
4	"Building Planning" – Kumar Swami, Charotar Publication
Codes of standards:	
1	SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi.
2	I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings.

CE401T - MECHANICS OF STRUCTURES

Practicals: 2 hrs / week

Credits: 1

Examination Scheme:

ISA: 25 Marks

Course Objectives: The objective of the course is to
1) To familiarize the students with the use equipments to determine mechanical properties of materials to acquire the knowledge in Material Testing. 2) To familiarize the students with various Types of load and material behaviour.

Course Outcomes:

COs	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Understand Concept of principal planes and stresses	Knowledge, Apply
CO2	Analysis of beam by Influence line diagram	Analyze
CO3	Analyze Shafts subjected to combined bending, torsion & axial thrust	Analyze
CO4	Explain the concept of Slope and deflection of determinate beam	Understand Analyze

Practicals:

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
1	Assignment based on **Principal planes & stresses**: Introduction, Basic concepts, Atleast 4 Numerical problems	4	Apply
2	Assignment based on **Combined direct and bending stresses**:Introduction, Basic concepts, Atleast 4 Numerical problems	4	Knowledge Apply
3	Assignment based on **Influence line diagrams**: Introduction, Basic concepts, Atleast 4 Numerical problems	4	Apply
4	Assignment based on **Buckling of long columns**: Introduction, Basic concepts, Atleast 4 Numerical problems	4	Knowledge, Analyze
5	Assignment based on **Slope and deflection of determinate beams**:Introduction, Basic concepts, Atleast 4 Numerical problems	4	Knowledge
6	Assignment based on **Torsion of circular shaft**: Introduction, Basic concepts, Atleast 4 Numerical problems	4	Analyze

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1	1	1	--	--	--	---	--	--	---	--	--	---	--
CO2	2	1	2	2	--	--	--	---	--	--	---	--	--	---	--
CO3	--	2	2	--	--	--	--	---	--	--	---	--	--	---	--
CO4	--	2	--	--	--	--	--	---	--	--	---	--	--	---	--

References:

Text Books		
1	"Strength of Materials" - R.K.Bansal., Laxmi Publications.	
2	"Strength of Materials" - S Ramamrutham, DhanapatRai Publications.	
3	"Structural Analysis" - Bhavikatti S.S, Vikas Publications house New Dehli.	
Reference Books		
1	"Mechanics of Materials" - Gere and Timoshenko, CBS publishers.	
2	"Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.	
3	"Mechanics of Material" - Beer and Johnston, M.	

CE404T – HYDRAULICS LAB

**Practicals:** 2 hrs / week
Credits: 1

Examination Scheme:
ISA: 25 Marks

Course Objectives: The objective of the course is to
1. To study uniform and non-uniform flow in open channel.   2. To study velocity and discharge measurement devices.   3. To study impact of jet, Pumps and turbines.

Course Outcomes:		
COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Provide students with basic knowledge of fluid properties and utilizing principles developed in fluid mechanics	Knowledge Understand
CO2	Develop the principle and equation for pressure flow and momentum analysis.	Understand
CO3	Provide the students with the analytical knowledge of pressure and velocity distribution in an open channel in order to solve practical problems	Understand
CO4	Illustrate and develop the equations and design principles for open channel flows, including sanitary and storm sewer design and flood control hydraulics.	Apply Evaluate

Practicals:

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
A.	Perform at least three experiments from the Following:		
1	Study of Specific Energy Curve for Different Discharges.	2	Apply
2	Calibration of V-Notch / Rectangular Notch.	2	Knowledge Apply
3	Study of Hydraulic Jump.	2	Apply
4	Study of Flow over Weirs.	2	Knowledge, Analyze
5	Impact of Jet.	2	Knowledge
B.	Study of Turbines (Demonstration).	2	Analyze
C.	Test on Centrifugal Pump.	2	Analyze
D.	Visit Report of hydropower plant.	2	Knowledge, Analyze
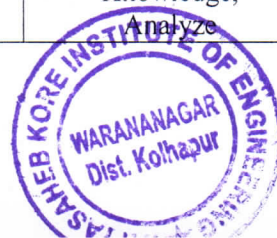
Mapping of POs & COs:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | If applicable | | |
													PSO1	PSO2	PSO3
CO1	1	2				2	--	---	--	--	--	1	--	1	2
CO2		1	2		1	2	--	--	--	--	--	--	--		1
CO3	2	1		1		--	--	--	--	--	--	1	--	2	1
CO4		2		2	1	1	--	--	--	--	--	--	--		2

References:

Text Books	
1	Mechanics – A.K. Jain – Khanna Pub., Delhi.
2	Open Channel flow – Rangaraju – Tata McGraw-Hill Pub. Co., Delhi.
3	Fluid Mechanics – K. Subramanyam – Tata McGraw-Hill Pub. Co., Delhi.
4	Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi / Seth – Standard Book House, New Delhi.
5	Fluid Mechanics and hydraulic machine-R.K.Bansal, Laxmi Pubication.
Reference Books	
1	Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland.
2	Flow in open channel – V. T. Chaw - McGraw-Hill International Book Co., Auckland.
3	Fluid Mechanics – K. L. Kumar – Eurasia Publication House, Delhi.

CE406T – DESIGN AND DEVELOPMENT OF CIVIL STUCTURE MODEL LAB

Practicals: 2 hrs / week
Credits: 1

Examination Scheme:
ISA: 50 Marks

Course Objectives: The objective of the course is to
1. To learn basic concept of drawing or sketch of physical model. 2. To develop model relevant to Civil Engineering. 3. To demonstrate usefulness of the model by experimenting/ describing future scope for its further development.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Prepare conceptual drawing or sketch of physical model.	Create Apply
CO2	Develop model relevant to Civil Engineering.	Create Apply
CO3	Demonstrate usefulness of the model by experimenting/ describing future scope for its further development.	Apply

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
1	**Introduction:** Types of models. Importance of physical models in Engineering. Different types of structures in Civil Engineering. Scope and limitations for the preparation of physical models in Civil Engineering. Site visit.	4	Apply
2	**Concept for development of model:** Literature review, survey for the requirements of models, Concept for the development of model. Points to be considered for the development of model. Scope of the physical model.	4	Apply
3	**Selection of materials and tools for the model:** Preparation of conceptual drawing for the physical model. Preparation of final draft, Final drawing for the physical model, approximate estimate and approval for the model.	4	Create Apply
4	**Development of the model:** Develop the model.	4	Create Apply
5	**Demonstration/ checking/ testing of model:** Suggestions for correction/ further development.	4	Apply
6	**Presentation of models :** Exhibition of models. Examination of model.	4	Apply
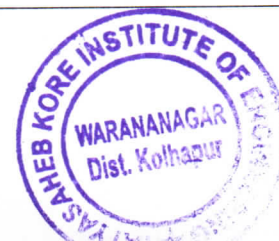
Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1		2													
CO2		1													
CO3				1											

References:

Text Books
1   " Building Construction Vol-I" - W.B. Mckay, Fifth Edition, Orient Longman Limited London,1995.

CE402P – ADVANCED SURVEYING LAB

Practicals: 2 hrs / week
Credits: 1

Examination Scheme:
ISA: 25 Marks
POE: 25 Marks

Course Objectives: The objective of the course is to		
5. To understand tacheometric surveying in distance and height measurements		
6. To get introduced to modern advanced surveying techniques involved such as Remote sensing, Total station, GPS, Photogrammetry		
7. To understand the elements of different types of curves and preliminary survey for road		

Course Outcomes:		
COs	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Adopt the principles of advanced surveying` instruments	Knowledge Understand
CO2	Formulate triangulation stations, flight planning and ground control points	Knowledge Understand
CO3	Apply GIS, GPS and arial photogrammetry concepts to civil engineering problems.	Understand and Apply
CO4	Demonstrate the ability to work on modern techniques coming in the civil engineering industry.	Knowledge Understand Apply
CO5	Evaluate the setting out of various curves	Apply

Practical's:

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
1	Tacheometry a) Determination of tacheometric constants. b) Determination of grade of a given line. c) Determination of area of polygon	6	Understand, Apply
2	Experiments using total station – any two.	4	Knowledge Apply
3	Setting out of simple curve- one linear and one angular method	4	Understand, Apply
4	Use of GPS	4	Understand, Knowledge Analyze
5	Project drawings	4	Knowledge, Analyze
6	Survey Projects 1. Road project – at least 1000m. 2. Radial contouring.		Apply, Analyze

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1	2		2	--	--	--	---	--	--	---	--	--	---	--
CO2	1	2		2	--	--	--	---	--	--	---	--	--	---	--
CO3	1	1	2		--	--	--	---	--	--	---	--	--	---	--
CO4		1	1	2	--	--	--	---	--	--	---	--	--	---	--
CO5	1	2	2												

References:

| Text Books |
|---|
| 1. Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni, Pune arthi Griha Prakashan |
| 2. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain, Laxmi cations. |
| 3. Surveying and Levelling by N. N. Basak, Tata McGraw Hill |
| 4. Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill |
| 5. Surveying and Levelling - R. Agor, Khanna Publishers, New Delhi |
| Reference Books |
| 1. Principles of Surveying. Vol. I by J. G. Olliver, J. Clendinning - Van Nostrand Reinhold |
| 2. Plane Surveying by A. M. Chandra, New Age International Publishers |
| 3. Surveying Vol. I & II by Dr. K. R. Arora, Standard Book House |
| 4. Plane surveying – David Clark. |

CE403P – CONCRETE TECHNOLOGY LAB WORK

Practicals: 2 hrs / week
Credits: 1

Examination Scheme:
ISA: 50 Marks
POE: 25 Marks

Course Objectives: The objective of the course is to
1. Impart knowledge of physical properties of ingredients of concrete and their effect on strength and durability.
2. Understand the factors affecting properties of concrete.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Impart knowledge of physical properties of ingredients of concrete and their effect on strength and durability.	Knowledge Understand
CO2	Explain the fundamentals of process of making good quality concrete and its elastic properties.	Understand Apply Evaluate
CO3	Design the concrete mix proportion as per Indian standard code of practice.	Evaluate
CO4	Demonstrate Non Destructive Testing (NDT) and evaluate quality of existing concrete.	Apply Evaluate

Practicals:

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
1	To determine fineness of cement by Sieve analysis and/or Blaine's air permeability method.	2	Knowledge
2	To determine the standard consistency of cement using Vicat's apparatus.	2	Knowledge Apply
3	To determine initial and final setting time of cement.	2	Knowledge Apply
4	Determination of soundness of cement by Le-Chatelier's apparatus and/or Auto Clave test.	2	Analyze
5	To determine compressive strength of cement.	2	Analyze
6	Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate).	2	Analyze
7	Determination of specific gravity of fine aggregates.	2	Analyze
8	Determination of specific gravity and water absorption of coarse aggregates.	2	Analyze
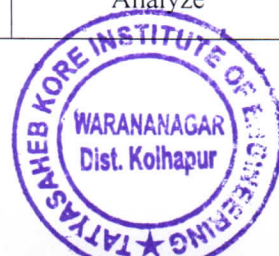
9	To determine flakiness and elongation index of coarse aggregates.	2	Analyze
10	To determine workability of fresh concrete by using slump cone.	2	Analyze Apply
11	To determine compaction factor for workability of fresh concrete.	2	Analyze Apply
12	To determine workability of fresh concrete by using Vee Bee Consitometer.	2	Analyze Apply
13	Nondestructive test on concrete by: Rebound Hammer Test, Ultrasonic Pulse Velocity Test.	2	Analyze Apply
14	Tests for compressive strength of concrete cubes for M20 or M30 (ACI 211.1-91, IS 10262- 2009 and IS 456 2000).	2	Analyze Apply

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
													If applicable		
CO1	1			1		1	1	---	--	--	--	--	--	--	--
CO2			1	2		2	2	--	--	--	--	--	--	--	--
CO3				1	1	1	--	1	--	--	--	--	--	--	--
CO4		1	2	2	2	2	--	--	--	--	--	--	--	--	--
CO5	2		1		1	1	1	2	--	--	--	--	--	--	--
CO6	1				2	2	--	2	--	--	--	--	--	--	--

References:

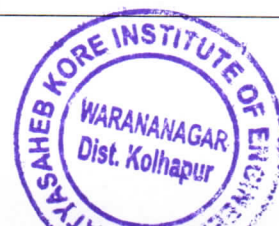| Text Books	
1	Shetty, M.S., Concrete Technology, S. Chand Publication.
2	Gambhir, M.L., Concrete Technology, Tata McGraw Hill.
Reference Books	
1	A. M. Neville, J. J. Brooks, "Concrete Technology" Pearson Education India
2	A. M. Neville, "Properties of Concrete", Pearson Education India.
3	R.S. Varshney, "Concrete Technology", Oxford and IBH.
4	P. Kumar Mehta, "Microstructure and properties of concrete", Prentice Hall.SP-26.

CE405P – BUILDING PLANNING AND DESIGN LAB

Practicals: 2 hrs / week
Credits: 1

Course Objectives: The objective of the course is to
1. To study Planning, designing of various public buildings considering principles of planning and Building Bye- Laws and regulations.
2. To study procedures for preparing perspective drawings of various objects.
3. To study Architectural composition and terms.
4. To understand preparation of submission drawings in standard format.
5. To understand various building services such as plumbing, electrification, Air conditioning, fire resistance, thermal insulation.

Course Outcomes:

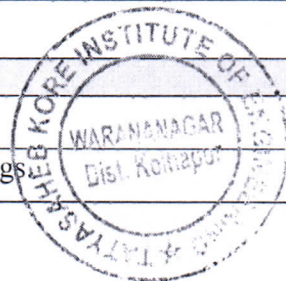| COs	At the end of successful completion of the course the student will be able to:	Blooms Taxonomy
CO1	Plan, design public building considering principles of planning and Building Bye- Laws and regulations.	Create Apply
CO2	Illustrate the procedures for preparing perspective drawings of various objects.	Analyze
CO3	Apply knowledge of architectural composition and terms for betterment of aesthetic view.	Apply
CO4	Prepare the submission drawing of residential building.	Create Apply
CO5	Illustrate the concepts of plumbing, electrification, ventilation, air conditioning and thermal insulation.	Analyze

Practicals:

Sr. No.	Practical/ Experiment/Tutorial Topic	Hrs.	Bloom's Taxonomy
1	Line plans of public buildings on graph paper of one building from each category.	2	Create Apply
2	Two exercises on parallel and angular perspective of simple objects	4	Create Apply
3	Planning and design of residential building (G+1) (any one type from Bungalow, twin bungalow, row house and Apartment).	8	Create Apply
4	Municipal Submission drawing of residential building planned above using AutoCAD.	8	Create Apply
5	Project Report of residential building planned above giving details of following systems • Stair Case • Drainage System • Water Supply System • Water Tank • Septic Tank • Design of terrace Drainage System.	2	Create Knowledge

References:

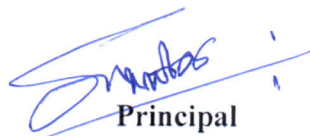| Text Books	
1	"Building Drawing with an integrated approach to Built-Environment" - Shah, Kale and Patki, Tata Mcgraw Hill publication
2	ding Construction" - B.C.Punmia, Laxmi Publications.
3	"Basic Civil Engineering" - G. K. Hiraskar, DhanpatRai Publications.
4	"A Text Book of Building Construction" - S.P. Arora, S.P. Bindra, Dhanpat Rai Publications.
5	"A Course in Civil Engineering Drawing" - V.B.Sikka, S.K.Kataria and Sons.
6	"Civil Engineering Drawing" - M. Chakraborty.
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2	"Handbook of Building Construction" - M. M. Goyal (Amrindra Consultancy).
3	"Practical Handbook – Buiding baandhkam Va dekhrekh Part I and II", Pramod Beri, DIT publication, third edition. (Marathi Language).
4	"Building Planning" – Kumar Swami, Charotar Publication
Codes of standards:	
1	SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi.
2	I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1				2									
CO2	1									2					
CO3	1														
CO4	2	1				2				1					
CO5		2				1									

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Principal
T.K.I.E.T.Warananagar