GURU KASHI UNIVERSITY
PUNJAB - INDIA

Program Syllabus Booklet

Bachelor of Technology in Civil Engineering
(B. Tech CE-101)

Session: 2021-22

Guru Gobind Singh College of Engg. & Tech.
Guru Kashi University, Talwandi Sabo

GURU KASHI UNIVERSITY
PUNJAB - INDIA

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Program Name: Bachelor of Technology in Civil Engineering

Program Code: 101

The Program Outcomes (POs) for the Program Bachelor of Technology in Civil Engineering are as follows:

PO	Statement
PO1	**Engineering knowledge:** To Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO2	**Problem analysis:** To Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** To Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: To Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** To Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** To Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** To Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Individual and team work:** To Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO9	**Communication:** To Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO10	**Project management and finance:** To Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO11	**Life-long learning:** To Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PO12	**Ethics:** To Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

The Program Specific Outcomes (PSOs) for the Program Bachelor of Technology in Civil Engineering are as follows:

PSO	Statement
PSO1	Enhancing the employability skills by making the students capable of qualifying National level competitive examinations
PSO2	Inculcating in students technical competencies to deal with practical aspects of civil engineering.
PSO3	Enforcement of environmental legislation and Public awareness related to civil engineering.

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Annexure -2

Semester: 1st (Physics Group)										
Sr.	Course Code	Course Name	Type of Course T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	101101	Physics (Mechanics & Mechanics of Solids)	T	3	1	0	4	40	60	100
2	101102	Mathematics –I (Calculus, Multivariable Calculus and Linear Algebra)	T	3	1	0	4	40	60	100
3	A103101	Basic Electrical Engineering	T	3	1	0	4	40	60	100
4	105105	Engineering Graphics & Design	T/P	1	0	4	3	60	40	100
5	101103	Physics (Mechanics & Mechanics of Solids) Lab	P	0	0	4	2	30	20	50
6	A103102	Basic Electrical Engineering Lab	P	0	0	2	1	30	20	50
Total No. of Credits				18						

Semester: 2nd (Chemistry Group)										
Sr.	Course Code	Course Name	Type of Course T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	A100102	Engineering Chemistry	T	3	1	0	4	40	60	100
2	101201	Mathematics –II (Differential Equations)	T	3	1	0	4	40	60	100
3	102202	Programming for Problem Solving	T	3	0	0	3	40	60	100
4	100108	English	T	2	0	0	2	40	60	100
5	105202	Workshop Manufacturing Practices	T/P	1	0	4	3	60	40	100
6	A100106	Engineering Chemistry Lab	P	0	0	4	2	30	20	50
7	102203	Programming for Problem Solving Lab	P	0	0	4	2	30	20	50
8	100109	English Lab	P	0	0	2	1	30	20	50
9	100304	Constitution of India	T	3	0	0	NC	NA	NA	NA
Total No. of Credits				21						

Semester: 3rd										
Sr.	**Course Code**	**Course Name**	**Type of Course T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	A101301	Surveying & Geomatics	T	3	1	0	4	40	60	100
2	A101302	Solid Mechanics	T	3	0	0	3	40	60	100
3	A101303	Fluid Mechanics	T	3	0	0	3	40	60	100
4	A101304	Mathematics-III (Transform & Discrete)	T	4	0	0	4	40	60	100
5	A101305	Basic Electronics & applications in civil engineering	T	3	0	0	3	40	60	100
6	A101306	Civil Engineering- Introduction, Societal & Global Impact	T	3	0	0	3	40	60	100
7	A101307	Surveying & Geomatics Lab	P	0	0	2	1	30	20	100
8	A101308	Solid Mechanics Lab	P	0	0	2	1	30	20	100
9	A101309	Fluid Mechanics Lab	P	0	0	2	1	30	20	100
10	A101310	Summer/Institutional Training	NA	NA	NA	NA	S/US*	NA	NA	NA
Total No. of Credits				23						

Note: Institutional Training will be imparted in the Institute at the end of 2nd Semester for 6-weeks duration. However this Course is not applicable to LEET Students.
* (S/US) Satisfactory/Unsatisfactory

Semester: 4th										
Sr.	**Course Code**	**Course Name**	**Type of Course T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	A101401	Concrete Technology	T	4	0	0	4	40	60	100
2	A101402	Material,Testing & Evaluation	T	5	0	0	5	40	60	100
3	A101403	Hydrology & Water Resources	T	4	1	0	5	40	60	100
4	A101404	Transportation Engineering	T	4	1	0	5	40	60	100
5	A101405	Disaster Preparedness & Planning	T	4	0	0	4	40	60	100
6	A100302	Environmental Studies	T	3	0	0	NC	NA	NA	NA
7	A101406	Concrete Technology Lab	P	0	0	2	1	30	20	50
8	A101407	Transportation Engineering Lab	P	0	0	2	1	30	20	50
9	100306	Mentoring and Professional Development of Students	P	0	0	4	S/US*	NA	NA	NA
Total No. of Credits							25			

*** (S/US) Satisfactory/Unsatisfactory**

Semester: 5th										
Sr.	**Course Code**	**Course Name**	**Type of Course T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	A101504	Environmental Engineering	T	3	0	0	3	40	60	100
2	101510	Mechanics of materials	T	2	1	0	3	40	60	100
3	101511	Hydraulic Engineering	T	3	0	0	3	40	60	100
4	101512	Structural Engineering	T	3	1	0	4	40	60	100
5	101513	Geotechnical Engineering	T	3	0	0	3	40	60	100
6	101514	Engineering Geology	T	3	0	0	3	40	60	100
7	100310	Professional Practice, Law & Ethics	T	3	0	0	3	40	60	100
8	101515	Hydraulic Engineering Lab	P	0	0	2	1	30	20	50
9	101516	Geotechnical Engineering Lab	P	0	0	2	1	30	20	50
10	100304	Constitution of India	T	3	0	0	NC	NA	NA	NA
11	101517	Survey Camp*	P	0	0	8	4	60	40	100
Total No. of Credits				25						

Survey Camp* - The Survey Camp will be organized at a hilly terrain and it will be organized after the final Examinations of 4th semester and it is evaluated in the 5th semester

Semester: 6th										
Sr.	**Course Code**	**Course Name**	**Type of Course T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	101610	Construction Engineering & Management	T	2	1	0	3	40	60	100
2	101611	Engineering Economics,Estimation & Costing	T	3	0	0	3	40	60	100
3	101612	Traffic Engineering & Management	T	3	0	0	3	40	60	100
4	101613	Repair & Rehabilitation of Structures	T	3	0	0	3	40	60	100
5	101614	Solid & Hazardous Waste Management	T	3	0	0	3	40	60	100
6	A101606	Irrigation Engineering	T	3	0	0	3	40	60	100
7		**Humanities Elective-I**	T	3	0	0	3	40	60	100
8	101615	Engineering Economics,Estimation & Costing	P	0	0	4	2	30	20	50
Total No. of Credits				23						

Humanities Elective-I(Select one of the following Courses)		
1	100307	Human Relations at Work
2	100308	Education, Technology and Society

Semester: 7th										
Sr.	**Course Code**	**Course Name**	**Type of Course T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	101708	Water Quality Engineering	T	3	0	0	3	40	60	100
2	101709	Design of Concrete Structures-I	T	3	0	0	3	40	60	100
3	101710	Metro Systems & Engineering	T	3	0	0	3	40	60	100
4	A101706	Earthquake Resistant Structures	T	3	0	0	3	40	60	100
5	101711	Project-1*	T	0	0	8	4	60	40	100
							16			

*-Project work, seminar and internship in industry or at appropriate work place

Semester: 8th										
Sr.	**Course Code**	**Course Name**	**Type of Course T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	101802	Foundation Engineering	T	3	0	0	3	40	60	100
2	101803	Rock Mechanics	T	2	0	0	2	40	60	100
3	101804	Design of Steel Structures	T	4	0	0	4	40	60	100
4	101805	Design of Concrete Structures-II	T	3	0	0	3	40	60	100
5	100309	Soft Skills & Interpersonal Communication	T	3	0	0	3	40	60	100
6	101806	Project-II	P	0	0	12	6	120	80	200
Total No. of Credits							21			

*-Project work,
seminar and internship in
industry or at appropriate
work place

Annexure-3

Physics (Mechanics & Mechanics of Solids) (101101)

Credits -4	**L**	**T**	**P**
Semester I	**3**	**1**	**0**

Course outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Acknowledge the basic mathematical concepts related to vector mechanics and statics.
CO2	Apply the principles of mechanics to the solutions of problems relating to stress-strain, moments and vector mechanics
CO3	Develop shear-moment diagrams of a beam and to find the maximum moment/shear and their locations
CO4	Recognize and solve the concepts and problems related to planar rigid body mechanics.
CO5	Use the tools, methodologies, language and conventions of physics to test and communicate ideas and explanations.

Mechanics

Module 1:

Vector mechanics of particles Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates; Potential energy function; F = - Grad V; Conservative and non-conservative forces; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Application: Satellite manoeuvres; Non- inertial frames of reference; Rotating coordinate system: Five-term acceleration formula — Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum; Harmonic oscillator; Damped harmonic motion; Forced oscillations and resonance;

Module 2:

Planar rigid body mechanics Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a

rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples;

Introduction to three-dimensional rigid body motion — only need to highlight the distinction from two-dimensional motion in terms of (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor; Three-dimensional motion of a rigid body wherein all points move in a coplanar manner: e.g. Rod executing conical motion with center of mass fixed — only need to show that this motion looks two-dimensional but is three-dimensional, and two-dimensional formulation fails.

Mechanics of Solids

Prerequisites: Module 1 and 2 of P and Mathematics course with ordinary deferential equations

Module 1:

Statics Free body diagrams with examples on modelling of typical supports and joints; Condition for equilibrium in three- and two- dimensions; Friction: limiting and non-limiting cases; Force- displacement relationship; Geometric compatibility for small deformations; Illustrations through simple problems on axially loaded members like trusses.

Module 2:

Mechanics of solids Concept of stress at a point; Planet stress: transformation of stresses at a point, principal stresses and Mohr's circle; Displacement field; Concept of strain at a point; Plane strain: transformation of strain at a point, principal strains and Mohr's circle; Strain Roscoe; Discussion of experimental results on one-dimensional material behavior; Concepts of elasticity, plasticity, strain hardening, failure (fracture / yielding); Idealization of one- dimensional stress-strain curve; Generalized Hooke's law with and without thermal strains for isotropic materials; Complete equations of elasticity; Force analysis — axial force, shear force, bending moment and twisting moment diagrams of slender members (without using singularity functions); Torsion of circular shafts and thin-walled tubes (plastic analysis and rectangular shafts not to be discussed); Moment curvature relationship for pure bending of beams with symmetric cross-section; Bending stress; Shear stress; Cases of combined stresses; Concept of strain energy; Yield criteria; Deflection due to bending; Integration of the moment-curvature relationship for simple boundary conditions; Method of superposition (without using singularity functions); Strain energy and complementary strain energy for simple structural elements (i.e. those under axial load, shear force, bending moment and torsion); Castigliano's theorems for deflection analysis and indeterminate problems.

Reference books:

1. I. H. Shames, 2002, *Engineering Mechanics: Statics and dynamics*, 4th Ed, PHI
2. F. P. Beer and E. R. Johnston, 2011,*Vector Mechanics for Engineers*, 9th Ed, Tata McGraw Hill,
3. J. L. Meriam and L. G. Kraige,2008,*Engineering Mechanics*, 6th Ed, John Wiley.

4. Andy Ruina and Rudra Pratap, 2011, *Introduction to Statics and Dynamics*, Oxford University Press.
5. David Kleppner & Robert Kolenkow, *An Introduction to Mechanics*,McGraw Hill Education.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	2	3	3	2	1	1	2	1	2	2	2	2	2	2
CO2	3	3	3	3	2	1	1	1	2	3	1	2	3	3	3
CO3	3	3	3	3	2	1	1	2	1	3	1	2	3	2	3
CO4	3	3	3	3	2	1	1	2	1	3	1	2	2	2	3
CO5	3	3	3	3	2	1	2	1	2	3	1	2	3	3	3
Average	**2.8**	**2.8**	**3**	**3**	**2**	**1**	**1.2**	**1.6**	**1.6**	**2.8**	**1.2**	**2**	**2.6**	**2.4**	**2.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

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Mathematics –I (Calculus, Multivariable Calculus and Linear Algebra) (101102)

Credits -4 **L T P**
Semester I **3 1 0**

Course outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Perform matrix operations and solve the matrix equation using elementary matrix operations
CO2	Use systems of linear equations and matrix equations to determine linear dependency or independency and Evaluate the eigen values and corresponding eigenvectors for a linear transformation
CO3	Set up and evaluate multiple integrals for regions in the plane to find area of the region bounded by curves and volume, surface area, Mass, C.G and M.I of solid geometric figures.
CO4	Demonstrate the fundamental theorem of calculus and use it for evaluating definite integrals and derivatives of integrals with variable limits of integration
CO5	Distinguish between the concepts of *sequence and series*, and determine limits of sequences and convergence and approximate sums

Course Outcomes

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

The students will learn:

- To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
- The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- The tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To deal with functions of several variables that are essential in most branches of engineering.
- The essential tool of matrices and linear algebra in a comprehensive manner.

Module 1:

Module 1a: ***Trigonometry:*** Hyperbolic and circular functions, logarithms of complex number resolving real and imaginary parts of a complex quantity, De Moivre's Theorem.

Module 1b*: Theory of equations:* Relation between roots and coefficients, reciprocal Equations, transformation of equations and diminishing the roots.

Module 2:

Module 2a: **Calculus: (6 hours)**

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 2b: **Calculus: (6 hours)**

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 2c: **Sequences and series: (Prerequisite 2b) (10 hours)**

Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 3 : Multivariable Calculus

Module 3a: **Multivariable Calculus (Differentiation) (Prerequisite 2b) (10 hours)**

Limit continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Module 3b: Multivariable Calculus (Integration) (Prerequisite 3a) (10 hours)

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

Module 4: Matrices and Linear Algebra

Module 4a: **Matrices (in case vector spaces is not to be taught) (14 hours)**

Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

Module 4b: **Matrices (in case vector spaces is to be taught) (8 hours)**

Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Module 4c: **Vector spaces (Prerequisite 4b) (10 hours)**

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank- nullity theorem, composition of linear maps, Matrix associated with a linear map.

Module 4d: Vector spaces (Prerequisite 4b-c) (10 hours)

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Textbooks/References:

(i) G.B. Thomas and R.L. Finney(2002), *Calculus and Analytic geometry*, 9th Edition, Pearson, Reprint.
(ii) Erwin kreyszig(2006), *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons.
(iii) Veerarajan T.(2008), *Engineering Mathematics for first year*, Tata McGraw-Hill, New Delhi.
(iv) Ramana B.V.(2010), *Higher Engineering Mathematics*, Tata McGraw Hill New Delhi, 11th Reprint.
(v) D. Poole(2005), *Linear Algebra: A Modern Introduction*, 2nd Edition, Brooks/Cole.
(vi) N.P. Bali and Manish Goyal(2008), *A text book of Engineering Mathematics*, Laxmi Publications, Reprint.
(vii) B.S. Grewal(2010), *Higher Engineering Mathematics*, Khanna Publishers, 36th Edition.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	3	2	1	2	-	2	2	2	2	2	2	2
CO2	3	3	3	2	2	1	-	1	2	3	2	3	3	3	3
CO3	2	3	3	2	2	2	1	-	1	2	1	2	2	3	2
CO4	2	3	2	3	1	-	2	2	2	3	2	3	2	1	3
CO5	3	2	2	2	2	2	1	2	-	3	-	3	2	2	2
Average	**2.4**	**2.6**	**2.4**	**2.4**	**1.8**	**1.5**	**1.5**	**1.6**	**2.2**	**2.6**	**2.2**	**2.6**	**2.2**	**2.2**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Basic Electrical Engineering

Course Code: A103101

Semester: 1st

L T P

Credits: 04 **3 1 0**

Course outcomes: On successful completion of this course, students would be able to:

CO	Statement
CO1	Discuss the DC and AC electrical circuit elements with RLC in detail.
CO2	Analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.
CO3	Analyze Single Phase AC Circuits and representation of alternating quantities and determining the power in these circuits.
CO4	Classify the different types of Electrical machines.
CO5	Understand the different type of electrical installation devices.

Course Content

Module 1: DC Circuits (8 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

Module 2: AC Circuits (8 hours)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three- phase balanced circuits, voltage and current relations in star and delta connections.

Module 3: Transformers (6 hours)

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module 4: Electrical Machines (8 hours)

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

Module 5: Power Converters (6 hours)

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

Module 6: Electrical Installations (6 hours)

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Text / Reference Books

(i) Kothari, D. P. and Nagrath, I. J. (2010). *Basic Electrical Engineering*. Tata McGraw Hill.
(ii) Kulshreshtha, D. C. (2009). *Basic Electrical Engineering*. McGraw Hill.
(iii) Bobrow, L. S. (2011). *Fundamentals of Electrical Engineering*. Oxford University Press.
(iv) Hughes, E. (2010). *Electrical and Electronics Technology.* Pearson,

Correlation of COs to the Program Outcomes (POs) and Program Specific Outcomes (PSOs) for Basic Electrical Engineering

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	2	2	1	1	2	1	2	1	2	2	2	2
CO2	1	2	2	2	-	1	2	1	1	2	2	1	3	3	2
CO3	2	3	-	3	2	1	1	2	2	1	2	2	2	2	-
CO4	3	2	2	2	2	2	-	1	1	2	-	2	3	2	2
CO5	2	2	2	3	2	1	2	2	1	2	1	2	2	2	2
AVERAGE	**1.8**	**2.2**	**2**	**2.4**	**2**	**1.2**	**1.2**	**1.6**	**1.2**	**1.8**	**1.2**	**1.8**	**2.4**	**2.2**	**2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Engineering Graphics & Design

Course Code: 105105

Semester: 1st

Credits -3

L	T	P
1	0	4

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Understand about engineering drawing applications and its importance in society.
CO2	Learn about the visual aspects of engineering design.
CO3	Understand the engineering graphics standards.
CO4	Understand the concept of solid modeling techniques.
CO5	Apply the computer-aided geometric design in engineering

Course Content

Module 1:

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

Module 2:

Orthographic Projections covering, Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Module 3:

Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Module 4:

Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

Module 5:

Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

Module 6:

Overview of Computer Graphics covering, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

Module 7:

Customization& CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Module 8:

Annotations, layering & other functions covering applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory including sketching of perspective, isometric, multi view, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerance techniques; dimensioning and scale multi views of dwelling;

Module 9:

Demonstration of a simple team design project that illustrates Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerance; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying color coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modeling (BIM).

References Books:

1. Gill, P.S.(2001).*Engineering Drawing*. S.K; Kataria and Sons,Ludhiana.
2. Bhatt, N.D.(2012).*Engineering Drawing*. Charotar Book Stall, Tulsi Sadan, Anand.
3. French, T.E. and Vierck. C.J.(1993).*Graphic Science*. McGraw-Hill, New York.
4. Zozzora, F.(1958).*Engineering Drawing*.McGraw Hill, NewYork.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS0 3
CO1	2	2	2	2	1	2	1	2	2	1	1	1	2	1	1
CO2	2	1	2	1	2	1	1	2	2	1	1	-	1	2	2
CO3	2	2	2	2	1	2	1	2	2	1	-	1	2	1	1
CO4	1	2	1	2	1	1	2	2	2	2	1	1	1	2	2
CO5	1	2	1	2	2	1	2	1	2	1	1	1	1	2	2
Average	**1.75**	**1.75**	**1.75**	**1.75**	**1.25**	**1.5**	**1.25**	**2**	**2**	**1.25**	**1**	**1**	**1.5**	**1.5**	**1.5**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

GURU KASHI UNIVERSITY
PUNJAB - INDIA

Physics (Mechanics & Mechanics of Solids) Lab (101103)

	L	T	P
Credits -2			
Semester I	**0**	**0**	**4**

Course outcomes: On successful completion of this course, the students will be able to:

CO	Statements
CO1	Describe the fundamentals of mechanics by using different kind of instruments and apparatus .
CO2	Verify that fundamental frequency of vibration of a steel bar clamped at one end is inversely proportional to the square of its length and measure the Young's modulus of bar.
CO3	Compare the moment of inertia of a solid sphere and hollow sphere or solid disc of same mass with the torsional pendulum.
CO4	Comprehend the torsional oscillation of pendulum in different liquid. and determine the rigidity modulus of the suspension wire using torsion pendulum.
CO5	Calculate the Momentum, Kinetic energy, and Velocity after collision.

COURSE CONTENTS:

1. Measurements of length (or diameter) using vernier caliper, screw gauge, and travelling microscope. Use of Plumb line and Spirit level.
2. To determine the Height of an object using a Sextant.
3. To determine the angular acceleration α and torque τ of flywheel.
4. To determine the Moment of Inertia of a Flywheel.
5. To verify that fundamental frequency of vibration of a steel bar clamped at one end is inversely proportional to the square of its length and measure the Young's modulus of bar.
6. To determine the Young's Modulus of a Wire by Optical Lever Method.
7. To determine the Elastic Constants/Young's Modulus of a Wire by Searle's method.
8. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
9. To determine the Modulus of Rigidity of brass.
10. To determine **g** by Bar Pendulum.
11. To determine **g** by Kater's Pendulum.
12. To determine **g** and velocity for a freely falling body using Digital Timing Technique.
13. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of **g** and (c) Modulus of rigidity.
14. To find the moment of inertia of an irregular body about an axis through its C.G with the torsional pendulum.
15. To compare the moment of inertia of a solid sphere and hollow sphere or solid disc of same mass with the torsional pendulum.

16. The variation of time period with distance between centre of suspension and centre of gravity for a bar pendulum and to determine: (i) Radius of gyration of the bar about an axis through its C.G. and perpendicular to its length. (ii) The value of **g** in the laboratory.
17. To determine the angular acceleration α and torque τ of flywheel.
18. To determine the moment of inertia of a flywheel.
19. To find the acceleration of the cart in the simulator.
20. To find the distance covered by the cart in the simulator in the given time interval.
21. To verify that energy conservation and momentum conservation can be used with a ballistic pendulum to determine the initial velocity of a projectile, its momentum and kinetic energy.
22. To verify the momentum and kinetic energy conservation using collision balls.
23. To understand the torsional oscillation of pendulum in different liquid. and determine the rigidity modulus of the suspension wire using torsion pendulum.
24. To find the Time of flight, Horizontal range and maximum height of a projectile for different velocity, angle of projection, cannon height and environment.
25. The Elastic and Inelastic collision simulation will help to analyse the collision variations for different situations.
26. Demonstration of collision behaviour for elastic and inelastic type.
27. Variation of collision behavior in elastic and inelastic type.
28. Study of variation of Momentum, Kinetic energy, Velocity of collision of the objects and the Center of Mass with different velocity and mass.
29. Calculation of the Momentum, Kinetic energy, and Velocity after collision.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal
4. Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
5. Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	3	2	1	2	-	2	2	2	2	2	2	2
CO2	3	3	3	2	2	1	-	1	2	3	2	3	3	3	3
CO3	2	3	3	2	2	2	1	-	1	2	1	2	2	3	2
CO4	2	3	2	3	1	-	2	2	2	3	2	3	2	1	3
CO5	3	2	2	2	2	2	1	2	-	3	-	3	2	2	2
Average	**2.4**	**2.6**	**2.4**	**2.4**	**1.8**	**1.5**	**1.5**	**1.6**	**2.2**	**2.6**	**2.2**	**2.6**	**2.2**	**2.2**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course name : Basic Electrical Engineering Lab

Course code : A103102

Semester: 1st

Credits -1

L	T	P
0	0	2

Course outcomes: On successful completion of this course, the students will be able to:

CO	Statements
CO1	Describe the fundamentals of mechanics by using different kind of instruments and apparatus .
CO2	Verify that fundamental frequency of vibration of a steel bar clamped at one end is inversely proportional to the square of its length and measure the Young's modulus of bar.
CO3	Compare the moment of inertia of a solid sphere and hollow sphere or solid disc of same mass with the torsional pendulum.
CO4	Comprehend the torsional oscillation of pendulum in different liquid. and determine the rigidity modulus of the suspension wire using torsion pendulum.
CO5	Calculate the Momentum, Kinetic energy, and Velocity after collision.

List of experiments/demonstrations:

- Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
- Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
- Transformers: Observation of the no-load current waveform on an oscilloscope (non- sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
- Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
-

- Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
- Torque Speed Characteristic of separately excited dc motor.
- Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super- synchronous speed.
- Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
- Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

Correlation of COs to the Program Outcomes (POs) and Program Specific Outcomes (PSOs) for Basic Electrical Engineering Lab

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO 2	PSO3
CO1	3	2	3	2	2	2	1	2	1	2	3	2	2	2	2
CO2	2	2	3	1	2	1	2	1	2	2	-	1	2	2	2
CO3	2	3	2	1	1	2	1	2	2	1	-	2	3	2	2
CO4	2	1	3	2	2	1	1	2	-	1	1	2	2	2	3
CO5	3	2	1	3	2	1	1	1	2	2	3	3	1	3	3
Average	**2.4**	**2**	**2.4**	**1.8**	**1.8**	**1.4**	**1.2**	**1.6**	**1.75**	**1.6**	**2.3**	**2**	**2**	**2.2**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course name: Engineering Chemistry
Course Code: A100102
Semester: 2nd

Credits: 04

L T P
3 1 0

Course Outcomes: On successful completion of this course, the students would be able to :

CO	Statement
CO1	Demonstrate Schrodinger equation, Particle in a box solution and their applications for conjugated molecules and Nanoparticles,
CO2	Evaluate band structure of solids and the role of doping on band structures.
CO3	Distinguish the ranges of Vibrational and rotational spectroscopy of diatomic molecules, Applications, Nuclear magnetic resonance and magnetic resonance imaging
CO4	Rationalize periodic properties such as ionization potential, electro-negativity, Oxidation states and electro-negativity.
CO5	List the Thermodynamic functions: energy, entropy and free energy and also Estimations of entropy and free energies.

Course Content

Module 1: Atomic and molecular structure (12 lectures)
Schrodinger equation, Particle in a box solution and their applications for conjugated molecules and Nanoparticles, Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations, Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Module 2: Spectroscopic techniques and applications (8 lectures)
Principles of spectroscopy and selection rules, Electronic spectroscopy, Fluorescence and its applications in medicine, Vibrational and rotational spectroscopy of diatomic molecules, Applications, Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques, Diffraction and scattering.

Module 3: Intermolecular forces and potential energy surfaces (4 lectures)
Ionic, Dipolar and Vander Waals interactions, Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

Module 4: Use of free energy in chemical equilibria (6 lectures)
Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria, Water chemistry, Corrosion,Use of free energy considerations in metallurgy through Ellingham diagrams.

Module 5: Periodic properties (4 Lectures)
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

Module 6: Stereochemistry (4 lectures)
Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

Module 7: Organic reactions and synthesis of a drug molecule (4 lectures)
Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Reference Books:

i. Mahan, B. H. (1987). University chemistry.
ii. Sienko, M. J. & Plane, R. A. *Chemistry. (1979): Principles and* Applications. New York: McGraw-Hill.
iii. Banwell, C. N. (1966). *Fundamentals of Molecular Spectroscop.* New York, McGraw-Hill.
iv. Tembe, B. L., Kamaluddin & Krishnan, (2008). M. S. *Engineering Chemistry (NPTEL Web-book)*.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS0 3
CO1	2	2	2	3	2	1	2	-	2	2	2	2	2	2	2
CO2	3	3	3	2	2	1	-	1	2	3	2	3	3	3	3
CO3	2	3	3	2	2	2	1	-	1	2	1	2	2	3	2
CO4	2	3	2	3	1	-	2	2	2	3	2	3	2	1	3
CO5	3	2	2	2	2	2	1	2	-	3	-	3	2	2	2
Average	**2.4**	**2.6**	**2.4**	**2.4**	**1.8**	**1.5**	**1.5**	**1.6**	**2.2**	**2.6**	**2.2**	**2.6**	**2.2**	**2.2**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

GURU KASHI UNIVERSITY
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Mathematics –II (Differential Equations) (101201)

Credits -4 **L T P**
Semester II **3 1 0**

Course outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Demonstrate the methods of forming and solving Ordinary differential equations and Solve linear differential equations with constant and variable coefficients
CO2	Explain the concept of differential equation and classifies the differential equations with respect to their order and linearity.
CO3	Solve first-order ordinary and exact differential equations and converts separable and homogeneous equations to exact differential equations by integrating factors.
CO4	Apply the method of undetermined coefficients to solve the non-homogeneous linear differential equations with constant coefficients.
CO5	Compare the Laplacian in plane, cylindrical and spherical polar coordinates, solutions of Bessels and Legendre functions.

Course Contents

Module 1: First order ordinary differential equations (6 hours)
Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: Equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 2: Ordinary differential equations of higher orders (8 hours)
Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 3: Partial Differential Equations – First order (6 hours)
First order partial differential equations, solutions of first order linear and non-linear PDEs.

Module 4: **Partial Differential Equations** – **Higher order** (10 hours)
Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables.
Boundary-value problems: Solution of boundary-value problems for various linear PDEs in various geometries.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.
7. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993.
8. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.
9. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.
10. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations,
11. University Science Press, Second Edition, 2010.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO /CO	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	1	1	2	1	1	1	2	2	2	2	2
CO2	2	3	3	2	2	1	2	-	2	3	2	2	2	1	1
CO3	3	2	2	2	1	-	2	1	-	-	2	3	1	2	2
CO4	2	2	2	2	2	2	-	2	2	3	1	3	2	2	3
CO5	2	2	2	3	1	1	1	-	2	1	1	2	1	3	2
Average	**2.4**	**2.2**	**2.4**	**2.2**	**1.4**	**1.2**	**1.7**	**1.3**	**1.7**	**2**	**1.6**	**2.4**	**1.6**	**2**	**2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Programming for Problem Solving

Course Code: 102202

Semester: 2nd

Credits- 04 **L T P**

3 0 0

Course Outcomes: On successful completion of this course, the students would able to:

CO	Statement
CO1	Design the algorithms to write a programs.
CO2	Apply arrays, pointers and structures to formulate algorithms and programs
CO3	Apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration
CO4	To implement conditional branching, iteration and recursion
CO5	Test and execute the programs and correct syntax and logical errors

Course Content

Unit 1: Introduction to Programming **(4 lectures)**
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - **(1 lecture).**
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. **(1 lecture)**
From algorithms to programs; source code, variables (with data types) variables and memory Locations, Syntax and Logical Errors in compilation, object and executable code- **(2 lectures)**
Unit 2: Arithmetic expressions and precedence (**2 lectures**)

Unit 3: Conditional Branching and Loops **(6 lectures)**
Writing and evaluation of conditionals and consequent branching **(3 lectures)**
Iteration and loops **(3 lectures)**

Unit 4: Arrays **(6 lectures)**
Arrays (1-D, 2-D), Character arrays and Strings

Unit 5: Basic Algorithms **(6 lectures)**
Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of Equations, notion of order of complexity through example programs (no formal definition required)

Unit 6: Function **(5 lectures)**
Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference.

Unit 7: Recursion **(4 -5 lectures)**
Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 8: Structure **(4 lectures)**
Structures, Defining structures and Array of Structures

Unit 9: Pointers **(2 lectures)**
Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Unit 10: File handling (only if time is available, otherwise should be done as part of the lab)

Text/Reference Books
1. Byron Gottfried, Schaum's (1995), *Outline of Programming with C*, McGraw-Hill
2. E. Balaguruswamy (2005) Programming in ANSI C, Tata McGraw-Hill

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	1	-	-	1	2	2	2	1	2	1
CO2	3	2	2	2	3	1	-	1	2	1	2	3	2	2	3
CO3	3	2	3	3	2	2	-	-	2	2	1	2	2	2	3
CO4	3	2	2	2	2	3	-	-	3	3	3	3	3	1	2
CO5	3	2	2	3	3	2	1	1	2	3	2	2	3	3	3
Average	**2.8**	**2.0**	**1.8**	**2.4**	**2.4**	**1.8**	**1**	**1**	**2.0**	**2.2**	**2.0**	**2.4**	**2.2**	**2.0**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name : English

Course Code: 100108

Semester: 2nd

Credit:- 02 **L T P**
2 0 0

Course outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Develop vocabulary and improve the accuracy in Grammar.
CO2	Apply the concepts of accurate English while writing and become equally ease at using good vocabulary and language skills.
CO3	Develop and Expand writing skills through Controlled and guided activities.
CO4	Compose articles and compositions in English.
CO5	Become autonomous and self-directed English language learners.

Course Content

Unit 1: Vocabulary Building

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.

Unit 2: Basic Writing Skills

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

Unit 3: Identifying Common Errors in Writing

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

Unit 4: Nature and Style of sensible Writing

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

Unit 5: Writing Practices

Comprehension, Précis Writing, Essay Writing

Reference Books::

1. Swan, Michael. (1995). *Practical English*. OUP.
2. Wood, F.T. (2007). *Remedial English Grammar*. Macmillan.
3. Zinsser, W. (2001). *On Writing Well*. Harper Resource Book.
4. Lyons, L. H. & Heasly, B. (2006). *Study Writing*. Cambridge University Press.
5. Kumar, S & Lata, P. (2011). *Communication Skills*. Oxford University Press.
6. CIEFL, Hyderabad. *Exercises in Spoken English. Parts. I-III*. Oxford University Press.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	-	-	-	-	-	1	-	-	-	3	-	1	1	2	-
CO2	-	-	-	-	-	1	-	-	-	3	-	1	1	1	-
CO3	-	-	-	-	-	1	-	-	-	3	-	1	-	1	-
CO4	-	-	-	-	-	1	-	-	-	3	-	2	1	1	-
CO5	-	-	-	-	-	1	-	-	-	3	-	2	1	2	-
Average						1				3		1.4	0.8	1.4	

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Workshop Manufacturing Practices

Course Code: 105202

Semester: 2nd

L T P

Credits: 03 **1 0 4**

Course Outcomes: On successful completion of this course, the students would be able to:

CO	Statement
CO1	Apply the various manufacturing methods in different fields of engineering.
CO2	Learn about the different fabrication techniques.
CO3	Learn about the practices in manufacturing of simple components using different materials.
CO4	Understand the advanced and latest manufacturing techniques being used in engineering industry.
CO5	Prepare different sand molds for various parts

Course Content

Module 1: (3 lectures)
Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods

Module 2: (1 lecture)
CNC machining, Additive manufacturing

Module 3: (1 lecture)
Fitting operations & power tools

Module 4: (1 lecture)
Electrical & Electronics

Module 5: (1 lecture)
Carpentry

Module 6: (1 lecture)
Plastic moulding, glass cutting

Module 7: (1 lecture)
Metal casting

Module 8: (1 lecture)
Welding (arc welding & gas welding), brazing [More hours can be given to Welding for Civil Engineering students as they may have to deal with Steel structures fabrication and erection; 3D Printing is an evolving manufacturing technology and merits some lectures and hands-on training.]

Workshop Practice: (60 hours)
1. Machine shop - 10 hours
2. Fitting shop - 8 hours
3. Carpentry - 6 hours
4. Electrical & Electronics - 8 hours
5. Welding shop - 8 hours (Arc welding 4 hrs + gas welding 4 hrs)
6. Casting - 8 hours
7. Smithy - 6 hours
8. Plastic moulding & Glass Cutting -6 hours

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

References Books:-

1. Raghuwanshi, B.S.(2009*). A Course in Workshop Technology, Vol 1 & II*.Dhanpat Rai &Sons.
2. Jain, R.K.(2010*).Production Technology*.Khanna Publishers.
3. Singh, S.(2003).*Manufacturing Practice*.S.K. Kataria &Sons.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS0 3
CO1	1	2	3	3	2	3	3	3	3	2	2	3	3	2	3
CO2	2	1	2	2	3	1	3	2	2	3	1	2	2	2	2
CO3	2	1	3	1	2	3	3	3	2	2	2	3	2	1	2
CO4	1	2	1	2	1	2	3	1	3	2	1	2	1	2	3
CO5	2	3	2	2	2	3	2	3	3	3	2	2	3	3	2
Average	**2.4**	**2.6**	**2.6**	**2.6**	**2.4**	**2.6**	**2.8**	**3**	**2.6**	**2.4**	**2.4**	**2.4**	**2.8**	**2.2**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course name: Engineering Chemistry Lab
Course Code: A100106
Semester: 2nd

L T P

Credits: 02 **0 0 4**

Course Outcomes: On successful completion of this course, the students would be able to:

CO	Statement
CO1	Estimate rate constants of reactions from concentration of reactants/products as a function of time
CO2	Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
CO3	Apply the theoretical concepts for result analysis and interpret data obtained from experimentation
CO4	Identify the compound using a combination of qualitative test and analytical methods

Course Content

Choice of 10-12 experiments from the following:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug

10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg .

The mapping of PO/PSO/CO attainment is as follows

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS0 3
CO1	2	2	2	3	2	1	2	-	2	2	2	2	2	2	2
CO2	3	3	3	2	2	1	-	1	2	3	2	3	3	3	3
CO3	2	3	3	2	2	2	1	-	1	2	1	2	2	3	2
CO4	2	3	2	3	1	-	2	2	2	3	2	3	2	1	3
CO5	3	2	2	2	2	2	1	2	-	3	2	3	2	2	2
Average	**2.2**	**2.6**	**2.2**	**2.2**	**1.8**	**1.5**	**1.5**	**1.6**	**1.7**	**2.6**	**1.8**	**2.6**	**2.2**	**2.2**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Programming for Problem Solving Lab

Course Code: 102203

Semester: 2nd

Credits- 02 **L T P**

0 0 4

Course Outcomes: On successful completion of this course, the students would be able to:

CO	Statement
CO1	Create, read and write to and from simple text files.
CO2	Identify and correct logical errors encountered at run time
CO3	Apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration
CO4	Represent data in arrays, strings and structures and manipulate them through a program
CO5	Test and execute the programs and correct syntax and logical errors

Course Content

Tutorial 1: Problem solving using computers
Lab1: Familiarization with programming Environment

Tutorial 2: Variable types and type conversions
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings, memory structure
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration)

Lab 8 and 9: Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

Tutorial 12: File handling
Lab 12: File operations

Text/Reference Books

1. Byron Gottfried, Schaum's (1995), *Outline of Programming with C,* McGraw-Hill
2. E. Balaguruswamy (2005) Programming in ANSI C, Tata McGraw-Hill.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	1	-	-	1	2	2	2	1	2	1
CO2	2	1	2	2	3	2	-	1	2	1	2	3	2	2	3
CO3	2	2	2	2	3	2	-	-	2	2	1	2	2	2	3
CO4	1	1	1	2	2	2	-	-	3	2	2	3	2	1	2
CO5	2	2	1	2	3	2	1	1	2	2	2	2	1	2	3
Average	**1.8**	**1.6**	**1.6**	**2**	**2.6**	**1.8**	**1**	**1**	**2**	**1.8**	**1.8**	**2.4**	**1.6**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name : English Lab
Course Code : 100109
Semester: 2nd

Credit :- 01

L	T	P
0	0	2

Course outcomes: On successful completion of this course, the students would be able to:

CO	Statement
CO1	Illustrate the importance of pronunciation and apply the same day to day conversation
CO2	Apply verbal and non-verbal communication techniques in the Professional Environment
CO3	Develop coherence, cohesion and competence in Oral discourse.
CO4	Handle the interview process confidently.
CO5	Communicate contextually in specific personal and professional situations with courtesy.

Course Content

Oral Communication

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	-	-	-	-	-	1	-	-	-	3	-	1	1	2	-
CO2	-	-	-	-	-	1	-	-	-	3	-	1	1	1	-
CO3	-	-	-	-	-	1	-	-	-	3	-	1	-	1	-
CO4	-	-	-	-	-	2	-	-	-	3	-	2	1	1	-
CO5	-	-	-	-	-	1	-	-	-	3	-	1	1	2	-
Average						1.2				3		1.2	0.8	1.4	

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course name: Constitution of India

Course Code: 100304
Semester: 2nd

L T P

Credits: NC **3 0 0**

Course Outcomes: On successful completion of this course, the students would be able to :

CO	Statement
CO1	Explain the various dimensions of Indian political system.
CO2	Access to the constitutional developments, composition, working of the constituent assembly and draft of the Indian constitution.
CO3	Illustrate fundamental rights, duties and directive principles of state policies.
CO4	Synthesize functioning of Indian government such as legislature, executives and judiciary.

Course Content

Module 1

Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution.

Preamble to the Indian Constitution Fundamental Rights & its limitations.

Module 2

Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties.

Union Executives – President, Prime Minister Parliament Supreme Court of India.

Module 3

State Executives – Governor Chief Minister, State Legislature High Court of State.

Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th & 91st Amendments.

Module 4

Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. Human Rights –Meaning and Definitions, Legislation Specific Themes in Human Rights- Working of National Human Rights Commission in India.

Powers and functions of Municipalities, Panchyats and Co – Operative Societies.

Module 5

Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility.

Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

Text Books:

1. Basu, Durga Das. (2012). *Introduction to the Constitution on India (Students Edn.)*. Prentice – Hall EEE
2. Haries, C.E., Pritchard, M.S. & Robins, M.J. (2003). *Engineering Ethics*. Thompson Asia.

The mapping of PO/PSO/CO attainment is as follows

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	1	2	1	1	-	1	2	2	1	-	1	1	1	1	2
CO2	1	1	-	1	-	2	2	2	2	1	2	1	1	1	2
CO3	1	2	2	1	1	1	2	2	2	1	2	2	-	2	2
CO4	2	2	2	2	1	1	2	2	1	2	2	2	1	2	2
CO5	2	1	1	2	1	1	2	1	1	1	2	2	1	2	2

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Surveying & Geomatics

Course Code: A101301

Semester: 3rd

Credits: 03 **L T P**

3 0 0

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Understand the concept, various methods and techniques of surveying
CO2	Compute angles, distances and levels for givenarea
CO3	Examine the concept of tachometry survey in difficult and hillyterrain.
CO4	Select the appropriate instruments for data collection and survey purpose
CO5	Analyze and retrieve the information from remotely sensed data and interpret the data forsurvey.

Course Contents

Unit-I: Introduction to Surveying: Principles, Survey stations, Survey lines- ranging, direct &indirect ranging, Bearing and its measurement with prismatic compass, calculation of angles from bearings, Local Attraction Leveling:, Principles of leveling- booking and reducing levels; differential, reciprocal leveling, profile leveling and cross sectioning. Digital and Auto Level, Errors in leveling; contouring: Characteristics, methods, uses; areas and volumes. Setting up the plane table and methods of plane tabling(Radiation and three point problem only).

Unit-II: Triangulation and Trilateration: Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Balancing of Traverse, Omitted Measurements, Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations. Triangulation - network- Signals. Baseline
- choices - extension of base lines - corrections - Trigonometric leveling.

Unit-III: Curves: Elements of simple and compound curves – Method of setting out Transition curve – length of curve – Elements of transition curve.

Photogrammetry Surveying: Introduction, Basic concepts, flight planning; Stereoscopy, photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes.

Unit-IV: Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, LADAR (drone and vehicle based)

Remote Sensing: Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.

Reference Books:

1. Duggal, S.K.(2004). *Surveying Vol I & II.*Tata McGrawHill.
2. Punmia,B.C. Jain,AshokKumar&Jain,ArunKumar(2005).*SurveyingVol.I. II&III*LaxmiPublications
3. Agor, R.(2007). *Surveying.*KhannaPublishers.
4. Bhavikatti, S.S. (2010). *Surveying & Levelling. Volume I &II.*

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS0 3
CO1	1	2	1	2	2	1	1	2	2	1	2	2	1	2	1
CO2	2	1	2	1	2	2	-	2	1	2	-	2	2	1	2
CO3	2	1	1	2	2	1	2	2	-	1	-	2	2	1	1
CO4	2	2	2	2	1	2	-	1	1	2	2	1	2	2	1
CO5	1	2	1	1	2	1	-	2	2	2	1	2	1	2	2
Average	**1.6**	**1.6**	**1.4**	**1.6**	**1.8**	**1.4**	**1.5**	**1.8**	**1.5**	**1.6**	**1.67**	**1.8**	**1.6**	**1.6**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Solid Mechanics

Course Code: A101302

Semester: 3rd

L T P

Credits: 03 **3 0 0**

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO 1	Understand the concept of static equilibrium, deformations, and material constitutive behavior.
CO 2	Describetheconceptsofstress,strainandelasticbehaviorofmaterialsincludingHooke's lawrelationshipstoanalyze structural members subjected to tension, compression andtorsion.

CO 3	Classifytheconceptof Mohr' scircleinthestress/straincalculations.
CO 4	Plot elastic curves for beams undergoing displacements under different loadings
CO 5	Develop SFD and BMD for different type of beams subjected to different types of loads

Course Contents

Unit-I: Concept of Equilibrium: Loads, supports, reactions, displacements; General equilibrium equations; Equilibrium of a point and a member; Concept of free body diagram; Statically determinacy of a problem.

Stresses and Strains: Concept of stress and strain; Type of stresses and strains; Stress-strain diagrams for ductile, brittle materials; Generalized Hooke's law; Concept of working stress and factor of safety; Lateral strain, Poisson's ratio and Volumetric strain; Elastic module and relationship between them; Bars of varying section, composite bars, thermal stresses.

Unit-II: Principal Stresses and Strains: Concept of principal stresses, principal strains and principal planes; use of Mohr circle in computation of stresses and strains; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress also with shear stress.

Shear Force and Bending Moment Diagrams: Introduction to the concept of shear force, bending moment and the sign convention; Shear force and bending moment diagrams for cantilever, simply supported and overhang beams subjected to point loads, uniformly distributed loads, uniformly varying loads, moments or their combination, point of contra flexure.

Unit-III: Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Bending and Shear Stresses: Assumptions - theory of simple bending; Derivation of bending equation; Centroid and section modulus of various cross sectional shapes including rectangular, circular, I, channel, angle etc.; Determination of bending stresses, bending stress distribution across various beam sections; Determination of shear stress, shear stress distribution across various beam sections.
Unit-IV: Columns and Struts: Stability of Columns; buckling load of axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load.

Torsion of Circular Shafts: Derivation of torsion equation and its assumptions, application of equation to circular shafts; combined torsion and bending of circular shafts, principal stress and maximum shear stress under combined loading of torsion and bending.

Stresses and strains in thin cylinders:- spherical shells subjected to internal pressures; Normal stress, tangential stress.

Reference Books:

1. Timoshenko, S. &Young, D. H. (2002). *Elements of Strength of Materials.* DVNC. New York. USA.
2. Khurmi,R.S. (2008). *Strength of Materials.* Vikas publication house Pvt. Ltd.
3. Singh,Sadhu. (2013).*Strength of Materials*. Khanna publishers, New Delhi
4. Subramanian, R. (2009). *Strength of Materials.* Oxford University Press. NewDelhi
5. Ramamurtham, S. (1980). *Strength of Materials*. Dhanpat Rai Publishing Co.(P) Limited

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS0 3
CO1	2	2	2	2	1	2	1	2	2	1	2	2	1	2	1
CO2	2	1	1	1	2	1	1	2	-	1	-	2	2	1	2
CO3	3	2	1	1	1	1	-	1	-	2	-	2	2	1	1
CO4	2	2	2	2	2	2	1	-	-	2	-	1	2	2	2
CO5	1	2	2	1	1	1	2	1	1	2	2	1	1	2	1
Average	**2**	**1.8**	**1.6**	**1.4**	**1.4**	**1.4**	**1.25**	**1.6**	**1.5**	**1.6**	**2**	**1.6**	**1.6**	**1.6**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Fluid Mechanics

Course Code: A101303

Semester: 3rd

Credits: 03L T P

3 0 0

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO 1	Acknowledge the basic terms used in fluid mechanics and its broadprinciples
CO 2	Estimate the forces induced on a plane/ submergedbodies
CO 3	Formulateexpressionsusingdimensionlessapproachandabletodeterminedesignparametersbycreatingreplica of prototype at appropriate scale.
CO 4	Illustratethecontinuity,momentumandenergyprinciplesanddesignthepipelinesusedforwatersupplyorsewage under differentsituation.
CO 5	Calculate drag force exerted by fluid on the body of varying shapes and able to minimizethem.

Course Contents

Unit-I: Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, Piezometer, U-Tube Manometer, U-Tube Differential Manometer, Micro manometers, pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

Unit-II: Fluid Kinematics - Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates

Fluid Dynamics - Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham'sπ-Theorem.

Unit-III: Laminar Flow & Turbulent Flow - Laminar flow through: circular pipes, parallel plates. Stoke's law, Reynolds experiment, Transition from laminar to turbulent flow. Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. Flow through Pipes: Loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel

Boundary Layer Analysis- Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub- layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

Unit-IV: Open Channel Flow - Introduction, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, Uniform Characteristics of uniform flow, Chezy's formula, Manning's formula. Most economical section of channel. Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses.

Reference Books:

1. Bansal, R.K. (2006). *Fluid Mechanics & Hydraulic Machines*. Chand & sons.
2. Seth& Modi. (2003). *Fluid Mechanics.* Standard Book House. Delhi.
3. Lal, Jagdish (1959). *Fluid Mechanics*. Metropolitian Book House Co. Pvt. Ltd.
4. Streetes, VL &Wylie,EB (2008). *Fluid Mechanic*. Mcgraw Hill Publications.
5. Potter, Cengage. (2016). *Fluid Mechanic.* John Wiley & Sons.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS0 3
CO1	2	1	2	1	1	2	1	1	-	-	1	-	2	2	2
CO2	2	1	1	1	2	2	1	1	-	2	1	-	1	1	1
CO3	2	1	2	1	1	1	1	1	-	1	2	-	2	1	1
CO4	2	1	1	1	2	1	1	2	2	1	1	1	1	2	1
CO5	1	2	1	1	1	1	1	1	1	2	2	2	1	1	2
Average	**1.8**	**1.2**	**1.4**	**1**	**1.4**	**1.4**	**1**	**1.2**	**1.5**	**1.5**	**1.4**	**1.5**	**1.4**	**1.4**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Mathematics-III (Transform & Discrete Mathematics)

Course Code: A101304

Semester: 3rd

Credits: 04 **L T P**

4 0 0

Course Outcomes:

On successful completion of this course, the students will be able to:

CO	**On successful completion of this course, the students will be able**
CO1	Apply the basic results on vector function, their properties and fields so as to solve problems ofengineering.
CO2	Calculate length, area and volume using integral calculus that is an important application inengineering.
CO3	Comprehend some real life problems in engineering using Gauss Divergence and

	Stokes' theorem.
CO4	Demonstrate Laplace transform of functions and its applications to solve differential equations that formreal life problems in engineering.
CO5	Apply Fourier Series, its properties and its applications to solve problems inengineering.

Course Contents

Section A

Unit I: Vector Calculus-I: Scalar and Vector point function, Gradient, Directional derivatives, Divergence, Curl and their identities, line, surface, volume integrals and their applications, Solenoidal and Irrotational fields.

Unit II: Vector Calculus-II: Applications of Green, Gauss and Stokes Theorems, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

Section B

Unit III: Transforms Calculus-I: Laplace Transform, Properties of Laplace Transform, Laplace Transform of Unit step function, Impulse function, Dirac-delta function, Periodic functions. Inverse Laplace Transform, convolution theorem, Evaluation of integrals by Laplace Transform, Applications to ODEs and PDEs.

Unit IV:**Transforms Calculus-II:** Fourier series, half range Fourier Sine and Cosine series, Fourier integrals, Gibbs Phenomenon, Fourier transforms, Relation between Laplace and Fourier transform, Properties of Fourier Transforms, Convolution Theorem and applications

Reference books:

1. ErwinKreyszig(2006),*AdvancedEngineeringMathematics*,9th Edition,JohnWiley &Sons.
2. B.S. Grewal(2000), *Higher Engineering Mathematics*, Khanna Publishers, 35th Edition.
3. Veerarajan T.(2008), *Engineering Mathematics*, Tata McGraw-Hill, New Delhi.
4. Thomas and Finney(2017), *Calculus and Analytic Geometry*, 9th Edition, Pearson.
5. R. K. Jain and S.R.K Iyengar(2017),*Advanced Engineering Mathematics*, 5th Edition.

The mapping of PO/PSO/CO attainment is as follows

PO/PSO /CO	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	2	3	1	3	3	1	2	3	2	3	2	2
CO2	3	1	1	2	2	1	1	1	2	3	2	2	2	1	1
CO3	1	3	2	3	1	2	3	2	2	3	1	2	3	2	1
CO4	2	2	3	1	3	2	2	2	1	3	3	2	1	3	2
CO5	3	2	1	3	2	3	1	1	3	3	2	2	3	2	3
Average	1.2	2	1.8	2.2	2.2	1.8	2.2	1.8	1.8	2.8	2.2	2	2.4	2	2.8

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Basic Electronics & applications in civil engineering

Course Code: A101305

Semester: 3rd

Credits: 03 **L T P**

3 0 0

Course Outcomes: On successful completion of this course, the students will be able to:

CO	**Statement**
CO1	Understand construction of diodes and their rectifier applications.
CO2	Appreciate the construction and working bipolar junction transistors andMOSFETs.
CO3	Design Op-Amp IC based fundamentalapplications.
CO4	Comprehend working of basic elements of digital electronics andcircuits
CO5	Comprehend working of basic elements of circuits

Course Contents

Unit I: **Semiconductor Diodes and Applications** - Semiconductor Diode - Ideal versus Practical, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications;

Unit II: **Transistors & Amplifiers** - Bipolar Junction Transistor (BJT) – Construction, Operation, Common Base, Common Emitter and Common Collector Configurations, Distortion, Operating Point, Voltage Divider Bias Configuration; Introduction to nMOS and pMOS.

Unit III: Operational Amplifiers and Applications - Introduction to Op-Amp, Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground, Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Differentiator and Integrator, Square Wave and Triangular Wave Generation.

Unit IV: Digital Electronics -Boolean Algebra - Binary, Octal, Hexadecimal Number Systems, Addition, Subtraction using 1's and 2's compliment method, Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); K- Map simplification Truth Tables and Functionality of Flip-Flops – SR, JK and DFlip-Flop.

Reference Books:

1. David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall,India.
2. SantiramKal(2002),BasicElectronics-Devices,CircuitsandIT Fundamentals,PrenticeHall,India.
3. Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals by PearsonEducation.
4. PaulB. Zbar,A.P.MalvinoandM.A.Miller(2009),BasicElectronics–AText-Lab.Manual,TMH
5. R. T. Paynter (2009), Introductory Electronic Devices & Circuits, Conventional Flow Version,Pearson.

The mapping of PO/PSO/CO attainment is as follows

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	2	3	1	3	3	1	2	3	2	3	2	2
CO2	3	1	1	2	2	1	1	1	2	3	2	2	2	1	1
CO3	1	3	2	3	1	2	3	2	2	3	1	2	3	2	1
CO4	2	2	3	1	3	2	2	2	1	3	3	2	1	3	2
CO5	3	2	1	3	2	3	1	1	3	3	2	2	3	2	3
Average	1.2	2	1.8	2.2	2.2	1.8	2.2	1.8	1.8	2.8	2.2	2	2.4	2	2.8

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name

Civil Engineering- Introduction, Societal & Global Impact

Course Code: A101306

Semester: 3rd

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Introduce theconstituentsof civilengineering.
CO2	Understand the vast interfaces this field has with the society atlarge.
CO3	Provide inspiration for doing creative and innovative work for the benefit of thesociety
CO4	Need to think innovatively to ensure Sustainability
CO5	Highlightthedepthofengagementpossiblewithincivilengineeringandexplorationofvariouspossibilitiesofa career in thisfield.

Course Contents

Unit I: Civil Engineering and its historical developments; Understanding the importance of Civil Engineering in shaping and impacting the world; the ancient and modern Marvels and Wonders in the field of Civil Engineering; Scope of work involved in various branches of Civil Engineering and future vision; Recent Civil Engineering breakthroughs and innovations; Avenues for entrepreneurial working.

Unit II: Understanding the past to look into the future; Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution and how these eras helped the civil engineering to grow; Concept of sustainability and the steady erosion of the environment due to haphazard developments; Global warming, its impact and possible causes; Atmospheric pollution; Pollution Mitigation measures; Health & Safety aspects for stakeholders; Environmental Impact Analysis: Concept and procedures; Innovations and methodologies for ensuring Sustainability.

Unit III: Infrastructure development and growth of the Nation; its effects on the GDP, employment, living standards of the people, etc.; Introduction and overview to Futuristic systems: Megacities, Smart Cities, Stadia; Roads, Railways, Metros, Hyper Loop, Airports, Seaports, River ways, Sea canals, Tunnels, bridges.

Unit IV: Energy Generation: Hydro, Solar, Wind, Wave, Tidal, Geothermal, Thermal energy; Telecommunication needs: towers, above-ground and underground cabling; Flood control: Dams, Canals, River interlinking; Energy efficient built-environments and LEED ratings; Awareness of various Codes & Standards governing Infrastructure development.

Reference books:

1. Salvadori, M and Heller. M.1964. *Structures in Architectures*. PHI.
2. Fintel, C.1985. *Handbook of Civil Engineering*. CBSPublications.
3. Turk, Ž iga (2014).*Global Challenges and the Role of Civil Engineering*. Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer,Dordrecht
4.Brito, Ciampi, Vasconcelos, Amarol, Barros. (2013) *Engineering impacting Social, Economical andWorking Environment*, 120th ASEE Annual Conference andExposition.
5. NAE Grand Challenges for Engineering (2006), Engineering for the Developing World.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS0 3
CO1	2	1	2	1	1	-	2	1	2	2	1	2	2	2	2
CO2	2	1	1	1	2	2	2	1	-	2	1	-	1	1	1
CO3	2	1	2	1	1	1	1	1	1	1	2	1	2	1	1
CO4	2	1	1	1	2	1	2	2	2	1	1	1	1	2	1
CO5	1	2	1	1	1	1	1	1	1	2	-	2	1	1	2

Average	**1.8**	**1.2**	**1.4**	**1**	**1.4**	**1.25**	**1.6**	**1.2**	**1.2**	**1.6**	**1.4**	**1.2**	**1.4**	**1.4**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Civil Engineering – Surveying& Geomatics Lab

Course Code: A101307

Semester: 3rd

Credits: 02L T P

2 0 0

Course Outcomes:On the successful completion of this course, students will be able to:

CO	Statement
CO1	Assess horizontal & vertical angles by Theodolite.
CO2	Survey the areausingdifferentmethodsofplanet Tablingandcompasssurvey andtoadjustthecompasstraversegraphically.
CO3	Compute the reduce levels using various methods ofleveling.
CO4	Predict the location of any point horizontally and vertically usingTachometry.
CO5	Learn the use of electronic surveying instruments.

Course Content

1. Measurement of bearing and angles with compass, adjustment of traverse by graphicalmethod.
2. Different methods of leveling, height of instrument, rise & fallmethods.
3. Measurement of horizontal and vertical angle byTheodolite.
4. Determination of tachometric constants and determination of reduced levels by tachometricobservations.
5. Plane table survey, different methods of plotting, three pointproblem.
6. Determination of height of an inaccessibleobject.
7. Setting out of circular curves in the field using differentmethods.Plotting of traverse using the Total Station andGPS.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	2	1	2	2	1	2	1	1	1	2	-	1	1	2	1
CO2	2	1	2	2	1	2	-	1	1	2	-	1	1	2	2
CO3	1	1	2	2	1	2	1	1	1	2	2	1	1	2	1
CO4	2	1	2	2	1	2	1	1	1	2	2	1	1	2	1
CO5	2	2	1	2	2	1	2	-	-	1	2	2	1	1	2

Average	**1.8**	**1.2**	**1.8**	**2**	**1.2**	**1.8**	**1.25**	**1**	**1**	**1.8**	**2**	**1.2**	**1**	**1.8**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Civil Engineering- Solid Mechanics Lab

Course Code: A101308

Semester: 3rd

Credits: 02LT P

2 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Understand the importance of physical properties ofsteel.
CO2	Identify and follow the codal provisions for testing different properties ofsteel.
CO3	Develop the stress-strain curve for axial compression, axial tension andshear.
CO4	Estimate the hardness and impact strength ofsteel.
CO5	Calculate flexural strength of a givenmaterial.

Contents

1. Determination of physical properties of steel including strength and ductility.
2. Study of tensile and compressive stress-strain behavior ofsteel.
3. Compression test onbrick.
4. Development of shear stress-strain curve for steel intorsion.
5. Determination of hardness of a material by Rockwell and Brinell hardness testingmachine.
6. Determination of impact strength of a material by Izod and Charpytests.
7. Determination of bending strength of a wooden beamspecimen.
8. Determination of fatigue strength of amaterial.
9. Study of behavior of columns and struts with different end conditions.
10. To verify the moment area theorem for slope and deflection of a givenbeam.

Reference books:

1. *Laboratory Manual of Testing Materials*. (1927). William Kendrick Hall

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	1	1	2	1	1	1	1	2	-	1	1	2	1
CO2	2	1	2	2	1	-	1	1	-	1	1	-	1	2	2
CO3	2	1	1	1	2	1	1	1	2	2	2	1	2	2	1
CO4	1	2	1	1	1	2	1	1	1	2	1	2	1	2	1
CO5	2	1	2	2	2	1	2	1	1	1	2	2	1	1	2
Average	**1.6**	**1.4**	**1.4**	**1.4**	**1.6**	**1.25**	**1.2**	**1**	**1.25**	**1.6**	**1.6**	**1.5**	**1.2**	**1.8**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Civil Engineering- Fluid Mechanics Lab

Course Code: A101309

Semester: 3rd

Credits: 02 **L T P**

2 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Select appropriate pressure measuring device under different condition of flow.
CO2	Determine the stability of a floating body.
CO3	Recognize and classify Bernoulli's theorempractically.
CO4	Calculate discharge of fluid through pipe, orifices and in openchannel.
CO5	Estimate the major and minor losses inpipe.

Lab Experiments

1. To study of pressure measuring devices as Piezometer, U-tube manometer, and pressuregauges.
2. To verify Bernoulli'sTheorem
3. To determine the Meta centric height of a of Floating Body under differentcondition.
4. To determine the coefficient of discharge of aVenturimeter.
5. To determine the coefficient of discharge of a OrificeMeter
6. To determine the coefficient of friction of different diameterpipes.
7. To estimate the minor losses as energy loss in pipe bend, sudden contraction or enlargement inpipe.

8. To determine the coefficient of discharge on rectangular andV-notches.
9. To determine the various element of a hydraulicjump.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO2	2	1	2	2	2	1	2	2	-	2	1	2	2	2	2
CO3	2	1	2	1	2	2	2	2	2	-	2	2	2	1	2
CO4	1	2	1	2	1	2	-	1	2	2	1	2	1	2	2
CO5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Average	**1.6**	**1.6**	**1.8**	**1.8**	**1.8**	**1.8**	**2**	**1.8**	**2**	**2**	**1.6**	**2**	**1.8**	**1.8**	**2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Concrete Technology

Course Code: A101401

Semester: 4th

Credits: 04 **L T P**

4 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Understand the relevance of different properties of constituent materials on properties ofconcrete.
CO2	Distinguish thebehavior and durability aspects of concrete under different loading and exposureconditions.
CO3	Solve the issues involved in production and use ofconcrete.
CO4	Design concrete mixes as per BISspecifications.
CO5	Learn about various testing methods for concrete and theirapplicability.

Course Contents

Unit I: Concrete and its ingredients: Properties of cement, aggregate, admixture, water and other additives; Related Indian Standard codes & guidelines.

Concrete behaviour in fresh and hardened states: Workability, Elasticity, Shrinkage, Creep, Fatigue, Strength in compression, tension, shear and bond; Influence of various factors on test results; Concrete cracking and type of cracks; Permeability and durability characteristics of concrete including resistance to sulphate & acid attack, alkali-aggregate reaction, freezing and thawing; Fire resistance.

Unit II: Production of concrete: Mixing, handling, placing, compaction of concrete and related issues; Quality control; Behaviour in extreme environmental conditions like hot weather, cold weather and under water conditions.

Concrete mix design: Basic considerations, proportioning of material, effect of various parameters, trial mixes, Design by IS code.

Unit III: Inspection and testing of concrete: Defects in concrete; Deterioration of concrete; Strength tests including compressive, split tensile, flexural, pullout etc.; Durability tests including permeability, carbonation, rapid chlorine ion penetration etc.; Destructive and Non-destructive testing of concrete; Acceptance and compliance requirements of concrete as per IS codes.

Unit IV: Special concretes: Types and specifications; Fibre reinforced and steel reinforced concrete; Polymer concrete; Light weight concrete, High strength concrete, Prestressed concrete, Self Compacting Concrete, Pervious Concrete, Self Healing Concrete.

Reference Books:

1. Neville, A. M. (2002).*Properties of Concrete.* PrenticeHall
2. Shetty, M. S. (2006). *Concrete Technology.*S.Chand &Co.
3. Gambhir, M. L. (2004). *Concrete Technology.* Tata McGraw Hill Publishers, NewDelhi
4. Santha Kumar,A. R.(2006). *Concrete Technology.* Oxford University Press. New Delhi

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	2	1	2	2	1	2	1	1	1	2	-	1	1	2	1
CO2	2	1	2	2	1	-	-	1	1	2	-	1	1	2	2
CO3	1	1	2	2	1	2	1	1	1	2	2	1	1	2	1
CO4	2	1	2	2	1	2	1	1	1	2	2	1	1	2	1
CO5	2	2	1	2	2	-	2	-	-	1	2	2	1	1	2
Average	**1.8**	**1.2**	**1.8**	**2**	**1.2**	**2**	**1.25**	**1**	**1**	**1.8**	**2**	**1.2**	**1**	**1.8**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Material, Testing& Evaluation

Course Code: A101402

Semester: 4th

Credits: 05 **L T P**

5 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Learn about the role of materials in civil engineering
CO2	Introduce common measurement instruments, equipments and devices to capture the material response under loading
CO3	Get exposure to a variety of established material testing procedures/techniques and the relevant codes ofpractice
CO4	Write a technical laboratory report
CO5	Use the ISI codes.

Course Contents

Unit-I: Introduction to Engineering Materials: Types, properties, advantages and uses of: Cement; Concrete; Admixtures; Glass and Plastics; Paints and Varnishes,; Acoustical material; Geo-synthetics, Bitumen and Asphalt; Ceramics and Refractory's ;Bricks; Concrete hollow blocks & Interlocking tiles.

Sand: Composition, types, Physical Properties, uses. Fly ash: Source, types, properties and uses Timbers: Properties, Seasoning, defects, preservation methods, laminates and adhesives,

Unit-II: Ferrous and nonferrous metals, Importance of Structural steel; Their characteristics and mechanical behavior (elastic, plastic and elasto plastic, strength and durability w.r.t Climatic variation); Creep – fundaments and characteristics, concept of fatigue of materials; Impact test, toughness – different materials.

Unit-III: Testing Procedures for bricks, reinforcing steel, fine aggregates, coarse aggregates, Physical

identification of tests for soils. Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results.

Unit-IV: Quality control- Use of test data/ testing reports in the material selection for various civil engineering projects /construction, Sampling, Acceptance criterion, Code of practice and guidelines in this regards for Cements; Aggregates; Concrete (plain and reinforced); Soils; Bitumen and asphaltic materials; Timbers; Glass and Plastics; Structural Steel.

Reference Books:

1. Chudley, R. (2006).*Building Construction Handbook*.R. Butterworth-Heinemann

2. Khanna, S.K., Justo, C.E.G &Veeraragavan, A. (2008). *Highway Materials and Pavement Testing.*Nem Chand & Bros, FifthEdition

3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineeringapplications

4.Komvopoulos ,Kyriakos.(2011). *Mechanical Testing of Engineering Materials*.Cognella

5. Dowling, E.N. (1993). (2011). *Mechanical Behaviour of Materials*. Prentice Hall InternationalEdition

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	2	2	2	-	2	2	2	2	2	2	2	2	1
CO2	2	2	2	2	1	2	2	2	2	2	1	2	2	2	2
CO3	2	2	2	2	2	2	2	2	-	2	2	-	2	1	1
CO4	2	2	2	2	2	2	-	1	2	2	1	2	1	2	2
CO5	1	2	2	1	2	-	2	2	2	2	2	2	2	2	2
Average	**1.6**	**2**	**2**	**1.8**	**1.8**	**2**	**2**	**1.8**	**2**	**2**	**1.6**	**2**	**1.8**	**1.8**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Hydrology & Water Resources

Course Code: A101403

Semester: 4th

Credits: 04 **L T P**

4 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Understand the interaction among various processes in the hydrologiccycle.
CO2	Calculate the average annual rainfall of any area using the rain gauge data and inter-relations ofvarious parameters as infiltration, evapotranspirationetc
CO3	Learn the various components of hydro graphs and able to estimate the runoff.
CO4	Find the water requirement for different crops and propose appropriate method of applyingwater.
CO5	Understand the distribution system of canal and various components of irrigationsystem.

Course Contents

Unit I: Introduction - Hydrologic Cycle, History of Hydrology, Water-Budget Equation, , World Water Balance, Applications in Engineering, Sources of Data.

Precipitation - Forms of Precipitation, Characteristics of Precipitation in India, Measurement of Precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth Area-Duration Relationships, Maximum Intensity/Depth-Duration-Frequency Relationship, Probable Maximum Precipitation (PMP), Rainfall Data in India.

Unit II: Abstractions from precipitation - Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Evapotranspiration, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, Modelling Infiltration Capacity, Classification of Infiltration Capacities, Infiltration Indices.

Runoff - Runoff Volume, SCS-CN Method of estimating runoff volume, Flow Duration Curve, Flow-Mass Curve, Hydrograph, Factors Affecting Runoff Hydrograph, Components of Hydrograph, Base Flow Separation, Effective Rainfall, Unit Hydrograph Surface Water Resources of India, Environmental Flows.

Unit III: Water withdrawals and uses – Water for Energy Production, Water for Agriculture, Water for Hydroelectric Generation; Flood Control. Analysis of Surface Water Supply, Water Requirement of Crops-Crops and Crop Seasons in India, Cropping Pattern, Duty And Delta; Quality of Irrigation Water; Soil-Water Relationships, Root Zone Soil Water, Infiltration, Consumptive use, Irrigation Requirement, Frequency of Irrigation; Methods of Applying Water to The Fields: Surface, Sub-Surface, Sprinkler and Trickle / Drip Irrigation.

Distribution systems - Canal Systems, Alignment of Canals, Canal Losses, Estimation of Design Discharge. Design of Channels- Rigid Boundary Channels, Alluvial Channels, Kennedy's and Lacey's Theory of Regime

Channels. Canal Outlets: Non-Modular, Semi-Modular And Modular Outlets.

Unit IV: Water Logging: Causes, Effects And Remedial Measures. Lining of Canals, Types of Lining. Drainage of Irrigated Lands: Necessity, Methods.

Dams and spillways - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

Reference Books:

1. Subramanya,.K.(1994). *Engineering Hydrology*. Mc-GrawHill.
2. Muthreja, K. N. (1987). *Applied Hydrology*.Tata Mc-GrawHill.
3. Subramanya,K.*(1990).Water Resources Engineering through Objective Questions*.Tata McGraw Hill.
4. Asawa,G. L. (2006).*Irrigation Engineering*.WileyEastern.
5. Mays, L.W. (2009).*Water Resources Engineering.* WileyEastern.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	2	2	2	2	2	2	2	2	-	2	2	2	1
CO2	2	2	1	2	2	1	-	1	2	2	2	1	2	2	1
CO3	1	2	2	2	2	2	2	2	2	1	-	2	2	2	2
CO4	2	2	1	2	2	1	-	1	2	2	2	1	2	2	1
CO5	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2
Average	**1.4**	**2**	**1.6**	**2**	**2**	**1.6**	**2**	**1.6**	**2**	**1.6**	**2**	**1.6**	**2**	**2**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Transportation Engineering

Course Code: A101404

Semester: 4th

Credits: 05 **L T P**

5 00

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Appreciate the importance of different modes of transportation and characterize the road transportation.
CO2	Check alignment and geometry of pavement as per Indian Standards according to topography.
CO3	Assess the properties of highway materials in laboratory
CO4	Explain the importance of railway infrastructure planning and design.
CO5	Identify the functions of different components of railway track.

Course Content

Unit I: Introduction: Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport.

Transportation Systems: Multi modal transportation system, Characteristics of Mass Transit systems including technical, demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System- Elevated, Surface and Underground construction, Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities.
Unit II: Highway Development & Planning: Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys; Highway Construction: Right of way; Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements

Unit III: Railway Engineering: History of Railways, Development of Indian Railway, Organization of Indian Railway, Important Statistics of Indian Railways. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge.

Railway Track: Requirements of a Good Track, Track Specifications, Detailed Cross-Section of Single/Double Track used in Indian Railways. Components of permanent way - Rails, Sleepers, Ballast, Sub-grade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.

Unit IV: Airport Engineering: Introduction, Air Transport Scenario in India and Stages of Development, National and International Organizations; Airport planning - Site selection, runway orientation, etc. Concept of Head Wind, Cross Wind, Wind Rose Diagram, Runway Configuration.

Aircraft Parking System & Visual Aids: Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons. Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.

Reference Books:

1. Khanna, S.K. & Justo, C.E.G. (1998). *Highway Engineering*. Nem Chand and Brothers.Roorkee.
2. Kadiyali, L.R. (1997). *Principles and Practice of Highway Engineering*. Khanna Publishers. New Delhi.
3. Flaherty, C.A.O.(1986).*Highway Engineering.Volume 2*. Edward Arnold. London.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	2	2	3	2	2	2	3	1	2	2	1	2	2	2	2
CO2	1	2	2	1	-	3	2	2	2	1	2	1	3	1	2
CO3	3	2	2	2	1	2	1	-	1	2	3	2	2	2	1
CO4	2	2	2	3	1	2	2	1	2	-	2	2	2	3	1
CO5	3	2	2	2	2	2	3	2	3	1	-	2	2	3	2
Average	**2.2**	**2**	**2.2**	**2**	**1.5**	**2.2**	**2.2**	**1.5**	**2**	**1.5**	**2**	**1.8**	**2.2**	**2.2**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Disaster Preparedness & Planning

Course Code: A101405

Semester: 4th

Credits: 04 **L T P**

4 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	**Statement**
CO1	Identify various types of disasters, their causes, effects & mitigation measures.
CO2	Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.
CO3	Understand the use of emergency management system to tackle the problems.
CO4	Discuss the role of media, various agencies and organizations for effective disaster management.
CO5	Design early warning system and understand the utilization of advanced technologies in disaster management.

Course Content

Unit1: Introduction to Disaster Management: Define and describe disaster, hazard, vulnerability, risk-severity, frequency and details, capacity, impact, prevention, mitigation. Disasters. Identify and describe the types of natural and manmade disasters, hazard an- vulnera muy pronte formula, mountain arta coastar arcus, Factors alcung vulnerability suc as impact of development projects and environment modifications (including dams, land-use changes, urbanization etc.), Disaster impacts (environmental, physical, social, ecological economie etc.); health, psycho-social issues demographic aspects (gender, age specia needs). Lessons and experiences on important disasters with specific reference to civil

engineering.

Unit II: Disaster Mitigation and Preparedness: Disaster Management Cycle-its phases; prevention, mitigation, preparedness, relief and recovery; structural and non structural measures; Preparedness for natural disasters in urban areas. Risk Assessment: Assessment of capacity, vulnerability and risk, vulnerability and ris mapping, stages in disaster recovery and associated problems; Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems,

Unit III: Post disaster response: Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, waste management, disease control, security, communications), reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector.

Unit IV: Integration of public policy. Planning and design of infrastrıcture for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.

Reference Books:

1. Iyengar, (1990). *Natural Hazards in the Urban Habitat C.B.R.I.*Tata McGraw Hill Publisher
2. Ingleton, Jon. (2004). *Natural Disaster management*. Tudor Rose Published.

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	2	3	2	2	2	1	-	2	1	2	2	1	2
CO2	1	2	2	2	2	2	-	1	-	-	2	1	3	2	3
CO3	2	3	1	2	2	2	-	2	2	-	3	2	2	3	2
CO4	3	2	2	2	3	2	3	2	2	2	2	2	2	1	2
CO5	2	1	2	2	2	2	2	1	2	-	2	2	2	2	3
Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.34**	**1.4**	**2**	**2**	**2**	**1.8**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Mechanics of materials

Course Code: 101510

Semester: 5th

L T P

Credits: 04 **4 0 0**

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Learn mechanics of deformable bodies introduce the four concepts –Force, stress, strain, displacement
CO2	Solve problems of engineering interest , In particular, force and displacement
CO3	Estimate possible modes of failure of these structural elements and the failure load is outlined.
CO4	Determine principal stresses and angles, maximum shearing stresses and angles, and the stresses acting on any arbitrary plane within a structural element.
CO5	Work out the problems and identify the fundamental elements involved in the mechanical design of engineering structures; e.g. which failure / safety criterion to apply for different applications, failure prediction and analysis.

Course Contents

UNIT I

Tension, compression & shear

Types of external loads – self weight – internal stresses – normal and shear stresses – strain – Hooke's law – Poisson's ratio – relationship between elastic constants – stress strain diagrams working stress – elongation of bars of constant and varying sections – statically indeterminate problems in tension and compression – assembly and thermal stresses – strain energy in tension, compression and shear.

UNIT II

Analysis of stress and strain

Stress on inclined planes for axial and biaxial stress fields – principal stresses – Mohr's circle of stress – principal strains – strain rosette – principal stress/strain problem as an eigenvalue problem.

UNIT III

Bending moment and shear force

Different types of beams – shear force and bending moment diagrams for simply supported overhanging and cantilever beams – relationship connecting intensity of loading, shearing force and bending moment – shear force and bending moment diagrams for statically determinate plane frames.

Stresses in laterally loaded symmetrical beams

Theory of simple bending – limitations – bending stresses in beams of different cross sections – moment of resistance- beams of uniform strength – beams of two materials – shearing stresses in bending–principal stresses in bending –strain energy due to bending.

UNIT IV

Theory of columns

Axial loading of short strut – long columns – differential equation of the elastic curve – Euler's formula – eccentric loading – direct and bending stresses – buckling load as an eigenvalue problem.

Torsion

Torsion of circular solid and hollow shafts – power transmission – strain energy in shear and torsion – close coiled and open coiled helical springs.

Thin and thick cylinders

Lame's equation – stresses in thick cylinders due to internal and external pressures – compound cylinders – shrink fit – wire wound pipes and cylinders.

Reference Books:

1. Gere, J.M. (2001).*Mechanics of Materials.* Thomson. Singapore.
2. Popov, E.P. (2002).*Mechanics of Materials*. Prentice Hall India. New Delhi.
3. Timoshenko, S.P. & Young, D.H. (2003). *Elements of Strength of Materials*. East West Press New Delhi.
4. Beer, F. P. & Johnston, E. R. (2005). *Mechanics of Materials*. Tata McGraw Hill, New Delhi,
5. Hearn, E. J. (1982).*Mechanics of Materials.* Pergamon Press. Oxford.
6. Nash, W. A. (1988). *Strength of Materials*. Schaum's Outline Series. McGraw Hill. New York

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	2	3	2	2	2	1	3	-	1	2	2	1	2
CO2	1	2	2	2	2	-	3	1	1	1	2	-	3	2	3
CO3	2	3	1	2	2	2	-	2	2	1	3	2	2	3	2
CO4	3	2	2	2	3	2	-	2	2	-	2	2	2	1	2
CO5	2	1	2	2	2	2	2	1	2	1	2	2	2	2	3

Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.34**	**1.4**	**2**	**1**	**2**	**2**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Hydraulic Engineering

Course Code: 101511

Semester: 5th

L T P

Credits: 03 **4 0 0**

CourseOutcomes: On the successful completion of this course, students will be able to:

	Statement
CO1	Make acquaintancewith different water resources terminology like hydrology, ground water, hydraulics of pipelines and open channel
CO2	Appreciate and use the energy and momentum equations.
CO3	Analyze flow in closed pipes, and design and selection of pipes including sizes.
CO4	Know about open channel cross sections, hydrostatic pressure distribution and Manning's law.
CO5	Learn drainage systems and wastewater sources and flow rates

Course Contents

UNIT I

Introduction to Open Channel Flow: Difference between Open Channel Flow and Pipe Flow, Types of Channel, Geometric parameters of a channel, Classification of Open Channel Flow, Continuity and Momentum equation.

Uniform flow: Resistance flow formula, Velocity distribution, Equivalent roughness coefficient, Velocity coefficients, Uniform flow in rigid boundary channel, Uniform flow in mobile boundary channel

UNIT II

Energy and Momentum Principle: Concept of Specific Energy, Critical Depth, Alternate depth, Specific Force, Sequent depth.

Non-Uniform Flow: Governing equation of GVF, Classification of Gradually Varied Flow, Computation of GVF profile, Rapidly Varied Flow, hydraulic Jump, Flow over a Hump, Flow in Channel Transition.

UNIT III

Canal Design: Concept of best hydraulic section, Design of rigid boundary canal, design of channel in alluvial formation- Kennedy's theory, Lacey's theory, Method of Tractive force, Free-board in canal.

Unsteady Flow: Wave and their classification, Celerity of wave, Surges, Characteristic equation

UNIT IV

Pipe Flow: Losses in pipes, Pipe in series and parallel, Pipe network analysis, Water hammer, Surge tank.

Hydraulic Model Study: Important dimensionless flow parameters, Similitude: Geometric, Kinematic and Dynamic Similarity, Model scales

Reference Books:

1. Chow,V.T. 2009.*Open Channel hydraulics.* McGraw Hill Publication
2. Subramanya, K. 1986.*Flow through Open Channels*. TMH, New Delhi
3. RangaRaju, K.G.1993.*Flow through open channels*. T.M.H. New Delhi
4. Srivastava, Rajesh 2008.Flow through Open Channels. Oxford University Press
5. Bansal,R.K. (1980). *Fluid Mechanics.* Laxmi Publications. New Delhi.
6. Modi &Seth. (2002). *Fluid Mechanic.* Standard Book House, Delhi.
7. Lal, Jagdish.(1895). *Fluid Mechanics.* Metropolitan Book Co. Pvt. Ltd.

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CO1	3	1	2	3	2	2	2	1	3	2	1	2	2	1	2
CO2	1	2	2	2	2	2	3	1	1	-	2	1	3	2	3
CO3	2	3	1	2	2	2	3	-	2	2	3	2	2	3	2
CO4	3	2	2	2	3	2	3	-	2	2	2	2	2	1	2
CO5	2	1	2	2	2	2	2	1	2	-	2	2	2	2	3
Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.6**	**1**	**2**	**2**	**2**	**1.8**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Structural Engineering

Course Code: 101512

Semester: 5th

Credits: 04 **L T P**

4 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Interpret the various methods of structural displacements.
CO2	Analyze the determinate structure and its reaction diagram.
CO3	Draw the influence line diagram for rolling loads.
CO4	Compute the pressure on supporting tower, suspension bridge etc. and to calculate loads for no tension criteria on domes chimneys and retaining walls.
CO5	Understandthe various methods of structural displacements.

Course Contents

UNIT I

Deflection of Beams

Derivation of basic equation of elastic curve, deflection in beams with different end conditions and different loadings by double integration method, Macaulay's method. Moment area theorem, conjugate beam method, unit method and strain energy method. Maxwell's reciprocal theorem.

UNIT II

Thin Cylinders and Spheres

Introduction, stresses and strains in thin cylinders and spherical shell, volumetric change, wire wound thin cylinders, thin vessels subjected to internal pressure.

Analysis of determinate Trusses

Introduction, determination of forces in member of trusses by method of joints, method of sections,Tension coefficient Deflection of Joints of plane frames by Castiglione's first theorem and unit load method.Analysis of Dams, chimneys and Retaining Walls Introduction, limit of eccentricity for no tension in the section, core of the section, middle third rule, wind pressure on chimneys.

UNIT III

Rolling Loads

Introduction to rolling loads and influence lines, Determination of shear force, bending moment at a section and absolute shear force and bending moment due to single point load, uniformly distributed load, several point loads etc.

Influence Lines

Construction of Influence lines for reaction, shear forces and bending moment for simply supported, overhauling and compound beams, influence lines for girders with floor beams, Influence lines for forces in members of frames. Influence lines for deflection.

UNIT IV

Arches

Introduction, Analysis of three hinged, two hinged and fixed arches, spandrel braced arches, Influence lines for horizontal thrust, shear force and bending moment for three hinged and two hinged arches.

Cables and suspension Bridges

Introduction, shape of a loaded cable, cable carrying point loads and UDL, cables with ends at different level, cable subjected to temperature stresses, suspension bridge with two hinged and three hinged stiffening girders, influence lines.

Reference Books:

1. Reddy, C.S.(2011).*Basic structural Analysis.* Mittal Publications. New Delhi.
2. Vazirani & Ratwani, (2002). *Analysis of Structures Vol- I and Vol.-II* Khanna Publishers. New Delhi.
3. Ramamurtham, S. (2011).*Structural analysis.* Dhanpat Rai Publishing Co.(P) Limited.

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO2	1	1	2	1	3	-	1	1	1	2	-	1	1	2	1
CO3	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO4	1	1	2	1	3	-	1	1	-	2	3	1	1	2	1
CO5	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
Average	**2.2**	**1.6**	**1.4**	**1.6**	**2.4**	**2**	**1.6**	**2.2**	**1**	**1.4**	**1.5**	**2.2**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Geotechnical Engineering

Course Code: 101513

Semester: 5th

Credits: 03 **L T P**

3 0 0

CourseOutcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Understand the origin of soil and to identify different types of soil and apply the knowledge of soil and rock to judge its behavior and suitability for civil engineering structures.
CO2	Describe Darcy's law for the flow of water through saturated soils; determine the coefficient of permeability and equivalent hydraulic conductivity in stratified soil
CO3	Explain the various physical and engineering characteristics of different types of soil
CO4	Calculate seepage, pore water pressure distribution, uplift forces and seepage stresses for simple geotechnical systems
CO5	Elaborate the direct shear test method and concept of slope stability structures

Course Contents

UNIT I

BasicConcepts: Definition of soil and soil mechanics common soil problems in Civil Engineering field. Principal types of soils. Important properties of very fine soil i.e.adsorbed water, BaseExchange and soil structure. Characteristics of main Claymineral groups i.e. montmorilonite, illiteand kaollite, Basic definitions in soil mechanics. Weight volume relationship, theory and determination of specific gravity from pycnometer test. Field density from sand replacement method and other methods.

UNIT II

IndexProperties: Grain size analysis. Stock's law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterberge Limits Flow Index and Toughness Index. Classification of soils as per Indian standard classification system(IS-1498-1970).

Compaction: Definition and object of compaction and concept of O.M.C. and zero Air Void Line. Modified proctor Test. Factors affecting compaction Effect of compaction on soil properties. Field compaction methods-their comparison of performance and relative suitability. Field compacative effort. Field control of compaction by proctor needle.

UNIT III

Consolidation: Definition and object of consolidation, difference between compaction and consolidation. Concept of various consolidation characteristics i.e. a_V, m_V and c_V primary and secondary consolidation.Terzaghi's Differential equation and its derivation Boundaryconditions for Terzaghi's solution for ondimensional consolidation concept of c_V,t_V &U. consolidation test determination ofc_V from curve fitting methods, consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect of disturbance one-Logsigma curves of normally consolidated clays, importance of consolidation settlement in the design of structures.

UNIT IV

Permeability and Seepage: Concept of effective stress principal, seepage pressure, critical hydraulic gradient and quicks and condition. Capillary phenomenon in soil. Darcy's Law and its validity, seepage velocity, co-efficient of permeability and its determination in the laboratory. Average permeability of stratifiedsoil mass, factors affecting 'K' and brief discussion.

Shear Strength: Stress analysis of a two dimensional stress system by Mohr circle. Coulomb's law of shear strength coulomb-Mohr strength theory. Direct, triaxial and unconfined shear strength tests. Triaxial shear tests based on drainage conditions. Derivation of skempton's pore pressure parameters. Stress strain and volume change characteristicsofsands.

Reference Books:

1. Arora, K.R. (2005). *SoilMecanics&FoundationEngg.* Standard Publishers & distributors.
2. Purshotama , Raj. (2005).*GeotechnicalEngineering.* McGraw Hill. Inc
3. Murthy,V.N. (2002).SoilMech&FoundationEngg. S. Chand Publishers.

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CO1	3	2	1	2	2	1	-	3	-	1	1	2	2	1	2
CO2	1	3	2	1	3	3	1	1	1	2	-	3	1	2	1
CO3	3	2	1	2	2	1	3	3	1	1	1	2	2	1	2
CO4	1	3	2	1	3	3	1	1	1	2	1	3	1	2	1
CO5	3	2	1	2	-	1	3	3	1	1	2	2	2	1	2
Average	**2.2**	**2.4**	**1.4**	**1.6**	**2.5**	**1.8**	**2**	**2.2**	**1**	**1.4**	**1.25**	**2.4**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Environmental Engineering

Course Code: A101504

Semester: 5th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Understand that different methods are used to purify the water and rectify the water which improves the standard and living style of the community
CO2	Determine the population forecast for a city to meet its water requirement
CO3	Design water treatment plant by different methods.
CO4	Know about the drainage and plumbing system in commercial, residential and industrial area
CO5	Visualize the impacts of human activities on environment and role of society in these impacts

Course Contents

UNIT I

PUBLICWATERSUPPLY: Beneficial uses of water, water demand, per capita demand, variation in demand; causes, detection and prevention of wastage of water, population forecasting.

SOURCESOFWATERSUPPLY: Surface and underground sources, relation and development of source in r/o quality and quantity of water, Development of wells, Storage reservoir-balancing and service storage, capacity determination by mass curve method. Intake and transmission system distribution systems: network design.

UNIT II

QUALITIY AND EXAMINATION OF WATER: Necessity for examination of water impurities in water, sampling ofwater, physical, chemical and bacteriological quality for domestic water supply. Drinking water quality standards and criteria.

WATER SUPPLY AND DRAINAGE OF BUILDINGS: System of water supply houses connections, mattering, internal distribution, and sanitary fittings pipe joints, Different types of pipes and pipes materials.

UNIT III

WATER TREATMENT: Unit operations in water treatment screening, sedimentation, and its theory sedimentation aided with coagulation, flocculation, sand filtration-slow, rapid, gravity and pressure filters, Disinfecting, Necessary: requirementsofdisinfectant,methods,ofdisinfectingdifferentpracticesofchlorinating.

UNIT IV

MISCELLANEOUSMETHODSOFWATERTREATMENT: Aeration, taste and odour control iron and manganese removal water softening processes Base Exchangeprocess, Swimming pool water Treatment

Reference Books

1. Punmia, B.C. Jain, Ashok.(1995).*Water Supply Engineering Environmental Engg.I.* chand & sons.
2. SINCERO,A. RCADIO. P.SINCERO,GREGORIAA. (1990). *Environmental Engineering-A Design Approach.* Affiliated East-West Press Private Limited.
3. PEAVY&ROWE,(1985). *Environmental Engineering and Technology.* Tata McGraw Hill Pub.co.

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CO1	3	1	1	1	1	3	1	1	2	1	-	1	1	1	2
CO2	2	2	3	3	2	1	3	-	1	2	-	2	3	3	1
CO3	1	1	1	1	1	-	1	1	-	1	1	1	1	1	3
CO4	2	2	3	1	1	1	3	2	1	2	-	2	3	2	1
CO5	3	1	1	3	2	-	1	1	2	1	1	1	1	1	2
Average	**2.2**	**1.4**	**1.8**	**1.8**	**1.4**	**1.67**	**1.8**	**1.25**	**1.5**	**1.4**	**1**	**1.4**	**1.8**	**1.6**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Engineering Geology

Course Code: 101514

Semester: 5th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Know the importance of seismic activity considerations in a terrain.
CO2	Learn geology and its types, various features like fault, fissures, weathering etc., minerals, rocks, and rock formations in relation to civil engineering structures.
CO3	Understand various techniques to analyze and to make possible solutions for various

	Geological Engineering problems.
CO4	Use various techniques to determine engineering properties of rocks etc.
CO5	Rationalize Geological considerations in the Engg. Projects like tunnels

Course Contents

UNIT I

General Geology:

Importance of Engg. Geology applied to Civil Engg. Practices. Weathering, definition, types and effect. Geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition.

Rocks & Minerals:

Minerals, their identification igneous, sedimentary & metamorphic rocks. Classification of rocks for engineering purposes. Rock quality designation (ROD)

UNIT II

Structural Geology:

Brief idea about stratification, apparent dip, true dip, strike and in conformities. Folds, faults & joints: definition, classification relation to engg., Operations.

Engineering Geology:

Geological considerations in the Engg. Projects like tunnels, highways, foundation, dams, reservoirs. Earthquake: Definition, terminology, earthquake waves, intensity, recording of earthquake.

UNIT III

Engineering properties of rocks and laboratory measurement:

Uniaxial compression test, tensile tests, permeability test, shear tests, size and shape of specimen rate of testing. Confining pressure, stress strain curves of typical rocks. Strength of intact and fissured rocks, effect of anisotropy, influence of effect of pore fluid type unsaturated and temperature.

UNIT IV

In-situ determination of Engg. Properties of Rock masses :

Necessity of in-situ tests, Uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses bore holeinercoring technique-bore hold deformation gauges.

Improvement in properties of Rock masses :

Pressure grouting for dams and tunnels, rock reinforcement rock bolting.

Reference Books:

1. Goodman,Richard E. (1989).*Introduction to Rock Mechanics.* Cbs Publishers & Distributors Pvt. Ltd.

2. Jaager C, (1979).*Rock Mechanics and Engg* George Allen & Unwin Publishers.

3. Arora, D.S. (1983).*Engineering Geology*. Khanna Publishers. New Delhi.

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CO1	3	1	2	3	2	2	-	1	3	2	1	2	2	1	2
CO2	1	2	2	2	2	2	2	1	1	-	2	1	3	2	3
CO3	2	3	1	2	2	2	2	2	2	2	3	2	2	3	2
CO4	3	2	2	2	3	2	3	2	2	2	2	2	2	1	2
CO5	2	1	2	2	2	2	-	1	2	1	2	2	2	2	3
Average	**2.2**	**1.8**	**1.8**	**2.2**	**2.2**	**2**	**2.34**	**1.4**	**2**	**1.75**	**2**	**1.8**	**2.2**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Professional Practice, Law & Ethics

Course Code: 100310

Semester: 5th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	**Statement**
CO1	Know the importance of human values.
CO2	Understand that excessive desires of the mind make a person unethical and restless, while fewer desires lead to peace and professional progress
CO3	Understand the different types of risks involved in unethical practices. Know various means of protesting against unethical practices.
CO4	Calculate the benefits of restraining from unethical practices like bribery, extortion, nepotism, nexus between politicians and industrialists.

CO5	Summarize case studies of ethical violations in Chernobyl meltdown, Challenger disaster, Ford Pinto design, and Kingfisher Airlines financial misappropriation

Course Contents

UNIT I

Introduction To Terminology In Ethics: Integrity, Honesty, Courage, Empathy, Personality, Character, Self-Confidence, Respect for Others – Work culture, Social responsibility, Responsibilities as a citizen, Cooperation and commitment – Religion vs. Spirituality, Philosophy, Customs and practices – Self-interest, Fear, Deception, Ignorance, Ego, Uncritical acceptance of authority.

UNIT II

Mind and Its Mysteries: What is Mind? Mind and body, Mind and food – Mental faculties – Theory of perception, Memory, Imagination, Thought-Culture, Desires – Cultivation of Virtues, Control of Senses and Mind – Concentration, Meditation and Enlightenment.

UNIT III

Risk and Safety In Engineering: Estimating risk – What is acceptable risk? – Engineer's liability, Changing legal rights of the employees by non-participation, by protest – Environmental laws and judicial intervention in related matters.

UNIT IV

Case Studies – Variety of Moral Issues in Profession: Chernobyl nuclear disaster, Fukushima reactor meltdown, Challenger blowup, Ford Pinto design, Highway safety, Kingfisher Airlines financial misappropriation.

Reference Books:

1. Harris, C. E &Rabins,M. J. 2013.*Engineering Ethics*. Cengage Learning Pub.
2. Martin, Mike &Schinzinger,Roland 2010.*Ethics in Engineering*. McGraw Hill Pub.
3. Sivananda,Swami.2007. *Mind Its Mysteries and Control*. Divine Life Society Pub.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
CO2	1	1	2	1	3	3	1	1	1	2	3	1	1	2	1
CO3	3	2	1	2	2	2	-	-	-	1	1	3	2	1	2
CO4	1	1	2	1	3	3	1	1	1	2	3	1	1	2	1
CO5	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
Average	**2.2**	**1.6**	**1.4**	**1.6**	**2.4**	**2.4**	**1.5**	**2**	**1**	**1.4**	**1.8**	**2.2**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Hydraulic Engineering Lab

Course Code: 101515

Semester: 5th

Credit: 01L T P

1 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Analyze flow in closed pipes, and design and selection of pipes including sizes.
CO2	Become familiar with open channel cross sections, hydrostatic pressure distribution and Manning's law.
CO3	Learn drainage systems and wastewater sources and flow rates
CO4	Know different water resources terminology like hydrology, ground water, hydraulics of pipelines and open channel
CO5	Analyze Hydraulic Jump

Course Contents

Experiment on the following

1. Determination of Manning's "n"
2. Specific energy curve
3. Gradually Varied Flow Profile
4. Hydraulic Jump
5. Flow over Hump
6. Flow through Channel Contraction
7. Pipe friction
8. Water hammer

Reference Books:

1. Fluid Mechanics and Hydraulic Machinery Laboratory Manual(2001). W. K.Hall

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	1	1	1	3	1	1	2	1	2	1	1	1	2
CO2	2	2	3	3	2	1	-	2	1	-	2	2	3	3	1
CO3	1	1	1	1	1	3	1	1	2	1	1	1	1	1	3
CO4	2	2	3	1	1	1	-	2	1	-	2	2	3	2	1
CO5	3	1	1	3	2	3	1	1	2	1	1	1	1	1	2
Average	**2.2**	**1.4**	**1.8**	**1.8**	**1.4**	**2.2**	**1**	**1.4**	**1.6**	**1**	**1.6**	**1.4**	**1.8**	**1.6**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Geotechnical Engineering Lab

Course Code: 101516

Semester: 5th

Credit: 01 **L T P**

1 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Describe Darcy's law for the flow of water through saturated soils; determine the coefficient of permeability and equivalent hydraulic conductivity in stratified soil
CO2	Understand the various physical and engineering characteristics of different types of soil
CO3	Calculate seepage, pour water pressure distribution, uplift forces and seepage stresses for simple geotechnical systems
CO4	Learn the direct shear test method and concept of slope stability structures
CO5	Plot zero air voids line.

Course Contents

1. Determination of in-situ density by core cutter method.
2. Determination of in-situ density by sand replacement method.

3.Determination of Liquid Limit &plastic Limit by Casagrande apparatus and penetrometer method.

4. Determination of specific gravity of soil solids by pycnometer method.

5.Grain size analysis of a given sample of sand and determination of coefficient of uniformity and coefficientof curvature.

6.Direct shear and triaxial test on a given soil sample. Unconfined compression test for fine grained soil.

7. Determination of permeability byconstant Head Method and variable head method.
8. Compaction test (proctor) and modified proctor test.
9. Plot of zero air voids line.
10. Determination of Relative Density of soil.

Reference Books:

1. Prakash, Shamsher&Jain, P.K.*1997. SoilTestingEngineeringManual*,

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	1	2	2	2	2	3	1	1	-	-	2	1	2
CO2	1	1	2	1	3	3	1	1	1	2	3	1	1	2	1
CO3	3	2	1	2	2	2	2	3	-	1	1	-	2	1	2
CO4	1	1	2	1	3	3	1	1	1	2	-	1	1	2	1
CO5	3	2	1	2	2	2	2	3	1	1	1	3	2	1	2
Average	**2.2**	**1.6**	**1.4**	**1.6**	**2.4**	**2.4**	**1.6**	**2.2**	**1**	**1.4**	**1.6**	**1.67**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Construction Engineering & Management

Course Code: 101610

Semester: 6th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Apply theoretical and practical aspects of project management techniques to achieve project goals
CO2	Possess organizational and leadership capabilities for effective management of construction projects
CO3	Use knowledge and skills of modern construction practices and techniques
CO4	Have necessary knowledge and skills in accounting, financing, risk analysis and contracting.
CO5	Use relevant software packages for planning, scheduling, executing and controlling of construction projects.

Course Contents

UNIT I

Construction Planning: Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

UNIT II

Quality Control And Safety During Construction Quality and Safety Concerns in Construction – Organizing for Quality and Safety – Work and Material Specifications – Total Quality Control – Quality Control by Statistical Methods – Statistical Quality Control with Sampling by Attributes – Statistical Quality Control with Sampling by Variables – Safety

UNIT III

Cost analysis and Contract**:**

Type of costs, cost time relationships, cost slopes, conducting a crash Programr, determining the minimum total cost of project, flexible budgets, cost &quality control, profit planning control &decision making, cost accounting systems, numerical problems. Updating a project, when to update, time grid diagram, resource scheduling. Planning of different components of civil engineering projects such as a house, workshop, dam, tunnel.

UNIT IV

Manpower Planning- Manpower Planning process, Organizing, Staffing, directing, and controlling – Estimation, manpower requirement – Factors influencing supply and demand of human resources – Role of HR manager – Personnel Principles..

Management And Development Methods 9 Wages and Salary, Employee benefits, Employee appraisal and assessment – Employee services – Safety and Health Management – Special Human resource problems – Productivity in human resources – Innovative approach to designing and managing organization – Managing New Technologies – Total Quality Management – Concept of quality of work life – Levels of change in the organizational Development – Requirements of organizational Development – System design and methods for automation and management of operations – Developing policies, practices and establishing process pattern – Competency up gradation and their assessment – New methods of training and development – Performance Management.

Reference Books:

1. Charles D Pringle, 1981.*Justin GooderiLongenecter, Management*, CE Merril Publishing Co.
2. Chitkara, K.K. 1998, *Construction Project Management Planning. Scheduling and Control*. McGraw-Hill Publishing Company. New Delhi.
3. Calin M. Popescu, ChotchaiCharoenngam, 1995.*Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications*. Wiley, New York.
4. Willis, E. M. *Scheduling Construction Projects*. John Wiley & Sons, 1986.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	3	2	1	3	2	1	2	1	2	2	2	2	1	2
CO2	1	1	1	3	1	1	2	-	2	1	1	-	1	2	1
CO3	3	1	1	1	3	2	1	2	1	-	2	2	2	1	2
CO4	1	3	2	3	1	1	2	2	1	-	2	2	2	1	2
CO5	3	3	2	1	3	2	1	-	2	1	1	1	1	2	1
Average	**2.2**	**2.2**	**1.6**	**1.8**	**2.2**	**1.6**	**1.4**	**2**	**1.4**	**1.33**	**1.6**	**1.75**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Engineering Economics, Estimation & Costing

Course Code: 101611

Semester: 6th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses
CO2	Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
CO3	Carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.
CO4	Understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.
CO5	Quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.

Course Contents

UNIT I

Introduction to economics – Flow in an economy – Law of supply and demand – Concept of engineering economics – Engineering efficiency – Economic efficiency – Scope of engineering economics – Element of costs – Marginal cost – Marginal revenue – Sunk cost – Opportunity cost – Break-even analysis – V ratio – Elementary economic analysis – Material selection for product design selection for a product – Process planning.

UNIT II

Introduction: Purpose of estimating and valuation, Types of estimates. Building Estimate: Main items and their unit of measurement, methods of Measurement-Methods of estimating quantities, Estimating quantities of building. Estimation of quantity of load bearing structure with single room & two rooms, Estimation of quantity single storied residential building, Estimation of quantity Different R.C.C. structures , Estimation of quantity of water supply and sanitary works, Estimation of quantity of culverts and bridges, Road estimating, Estimation of quantity of Trusses. Introduction to estimates of other Civil engineering structures

UNIT III

Market Survey: Traditional and modular materials, Market survey of materials of Construction, Wages of labour, Tools plant and equipment of construction. Rate Analysis : Prerequisites, factors affecting rate analysis, over head expenses, procedure for rate analysis, schedule of rates, Task work: labour requirement for different works, material requirement for different works, Rate analysis of different Items of work. Abstracting and Billing: Purpose of abstract, preparation of abstract, measurement and billing, Checking of bills and final bill

UNIT IV

Valuation: Purpose of valuation, types of property- Depreciation, Sinking fund, Lease hold and free hold property, obsolescence, Gross income, Outgoing and Net income, Capitalized value and year's purchase. Rental method of valuations, and typical problems.

Reference Books:

1. Rangwala, S.C. (1982). *Estimating and Costing.* Anand. Charotar Book Stall
2. Chakraborti, M. (1992).*Estimating Costing and Specification in Civil Engineering*. Calcutta Publishers.
3. Dutta, B.N. (2002).*Estimating and Costing*. Khanna Publisher.
4. Mahajan, Sanjay. (2000). Estimating and Costing. SatyaParkashan. Delhi
5. Singh, Gurbakshish.(1998).*Quality surveying.* Eagle Prakashan. Jalandher

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	1	1	1	1	3	1	1	2	1	2	1	1	1	2
CO2	2	2	3	3	2	1	-	2	1	2	2	2	3	3	1
CO3	1	1	1	1	1	3	1	1	2	1	-	1	1	1	3
CO4	2	2	3	1	1	1	2	2	1	2	2	2	3	2	1
CO5	3	1	1	3	2	3	1	1	2	1	1	1	1	1	2
Average	**2.2**	**1.4**	**1.8**	**1.8**	**1.4**	**2.2**	**1.25**	**1.4**	**1.6**	**1.4**	**1.75**	**1.4**	**1.8**	**1.6**	**1.8**

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Course Name: Traffic Engineering & Management

Course Code: 101612

Semester: 6th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Carry out surveys involved in planning and highwayalignment
CO2	Design the geometric elements of highways andexpressways
CO3	Know traffic studies and implement traffic regulation and control measures and intersectiondesign
CO4	Characterize pavement materials
CO5	Learn about flexible and rigid pavements as perIRC

Course Contents

UNIT I

Traffic stream characteristics

Introduction to traffic engineering: Road user characteristics, human and vehicle characteristics; Fundamental parameters and relations of traffic flow: speed, density, volume, travel time, headway, spacing, time-space diagram, time mean speed, space mean speed and their relation, relation between speeds, flow, density, fundamental diagrams; Traffic stream models: Green shield's model, Greenberg's logarithmic model, Underwood's exponential model, pipe's generalized model, multi-regime models;

UNIT II

TrafficSurveys

Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including nonmotorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation -Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance.

UNIT III

Traffic Design and Visual Aids

Intersection Design – channelization, Rotary intersection design – Signal design – Coordination of signals — Grade separation – Traffic signs including VMS and road markings – Significant roles of traffic control personnel – Networking pedestrian facilities and cycle tracks.

UNIT IV

TrafficManagement

Area Traffic Management System – Traffic System Management (TSM) with IRC standards -Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods -Congestion and parking pricing – All segregation methods- Coordination among different agencies – Intelligent Transport System for traffic management, enforcement and education.

Reference Books:

1. Roess, RP. McShane, WR. &Prassas,ES.(1998), *Traffic Engineering*. Prentice Hall.

2. May, A. D.(1990). *Fundamentals of Traffic Flow.* Prentice Hall.

3. Papacostas, C.S.(1987).*Fundamentals of Transportation Engineering*. Prentice Hall.

4. Kadiyali, L.R.(1987).*Traffic Engineering and Transportation Planning.* Khanna Publications.

5.*Highway Capacity Manual* (2000). Transportation ReseFarch Board, USA.

6. Khanna,S.K. & Justo, C.E. G.(1991). *Highway Engineering*.Khanna Publications.

7. Pingnataro, G. J.(1970). *Principles of Traffic Engineering.* McGraw - Hill.

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	3	2	1	3	2	1	2	1	2	2	2	2	1	2
CO2	1	1	1	3	1	1	2	1	2	1	1	1	1	2	1
CO3	3	1	1	1	3	2	1	2	1	2	2	2	2	1	2
CO4	1	3	2	3	1	1	2	2	1	2	2	2	2	1	2
CO5	3	3	2	1	3	2	1	1	2	1	1	1	1	2	1
Average	**2.2**	**2.2**	**1.6**	**1.8**	**2.2**	**1.6**	**1.4**	**1.6**	**1.4**	**1.6**	**1.6**	**1.6**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Repair & Rehabilitation of Structures

Course Code: 101613

Semester: 6th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Gain the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures..
CO2	Learn various distress and damages to concrete and masonry structures
CO3	Study the various types and properties of repair materials
CO4	Understand the importance and methods of substrate preparation
CO5	Know various repair techniques of damaged structures, corroded structures

Course Contents

UNIT I

Introduction Maintenance, rehabilitation, repair, retrofit and strengthening, need for rehabilitation of structures. Cracks in R.C. buildings Various cracks in R.C. buildings, causes and effects

Maintenance importance of maintenance, routine and preventive maintenance. Damages to masonry structures Various damages to masonry structures and causes

UNIT II

Repair materials Various repair materials, Criteria for material selection, Methodology of selection, Health and safety precautions for handling and applications of repair materials Special mortars and concretes Polymer Concrete and Mortar, Quick setting compounds Grouting materials Gas forming grouts, Salfoalumate grouts, Polymer grouts, Acryl ate and Urethane grouts. Bonding agents Latex emulsions, Epoxy bonding agents. Protective coatings Protective coatings for Concrete and Steel FRP sheets

UNIT III

Damage diagnosis and assessment Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Carbonation depth testing, Corrosion activity measurement Substrate preparation Importance of substrate/surface preparation, General surface preparation methods and procedure, Reinforcing steel cleaning

UNIT IV

Crack repair Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenously healing, Overlays, Repair to active cracks, Repair to dormant cracks. Corrosion of embedded steel in concrete Corrosion of embedded steel in concrete, Mechanism, Stages of corrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns) Jacketing, Column jacketing, Beam jacketing, Beam Column joint jacketing, Reinforced concrete jacketing, Steel jacketing, FRP jacketing. Strengthening Strengthening, Beam shear strengthening, Flexural strengthening

Reference Books:

1. Shetty,M.S.(2008).*Concrete Technology – Theory and Practice*. S.Chand and Company.
2. DovKominetzky, M.S.(2001). *Design and Construction Failures*. Golgotha Publications Pvt. Ltd.
3. Ravishankar. K. & Krishnamoorthy, T.S.(2004). *Structural Health Monitoring Repair and Rehabilitation of Concrete Structures*. Allied Publishers,
4. Gambhir, M.L. CPWD and Indian Buildings Congress. (2008). *Hand book on Seismic Retrofit of Buildings*. Narosa Publishers.

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	3	2	1	3	2	1	2	1	2	2	2	2	1	2
CO2	1	1	1	3	1	1	2	-	-	1	1	-	1	2	1
CO3	3	1	1	1	3	2	1	2	1	2	2	-	2	1	2
CO4	1	-	2	3	1	1	2	2	1	2	2	2	2	1	2
CO5	3	3	2	1	3	2	1	-	2	1	1	1	1	2	1
Average	**2.2**	**2**	**1.6**	**1.8**	**2.2**	**1.6**	**1.4**	**2**	**1.25**	**1.6**	**1.6**	**1.33**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Solid & Hazardous Waste Management

Course Code: 101614

Semester: 6th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Understand the problems of municipal waste, biomedical waste, hazardous waste, e waste, industrial waste etc.
CO2	Apply knowledge of legal, institutional and financial aspects of management of solid wastes
CO3	Become aware of Environment and health impacts solid waste mismanagement.
CO4	Learn engineering, financial and technical options for waste management
CO5	Provide information about the awareness of hazardous waste related health and environmental problem

Course Contents

UNIT I

General introduction including definitions of solid waste including municipal, hospital and industrial solid waste; legal issues and requirements for solid waste management and health and environmental issues related to solid waste management.

Sampling and characterization of solid waste

UNIT II

Analysis of hazardous constituents in solid waste including QA/QC issues

Municipal Solid Waste Management – Fundamentals Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options

UNIT III

Hazardous Waste Management – Fundamentals Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects

Environmental Risk Assessment Defining risk and environmental risk; methods of risk assessment; case studies

UNIT IV

Biological Treatment of Solid and Hazardous Waste Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation

Landfill design Landfill design for solid and hazardous wastes; leach ate collection and removal; landfill covers; incineration

Reference Books:

1. Pichtel,John.(2005). *Waste Management Practices CRC Press*. Taylor and Francis Group

2. LaGrega, M.D. Buckingham,P.L. & Evans, J.C. (1994). *Hazardous Waste Management*. McGraw Hill International Editions. New York.

3. Watts,Richard J. (1997).*Hazardous Wastes - Sources, Pathways.* Receptors John Wiley and Sons. New York.

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	1	2	2	1	1	-	2	1	-	2	1	2	1
CO2	2	1	2	1	2	2	2	-	1	2	1	2	2	1	2
CO3	1	2	1	1	2	1	1	1	-	1	1	2	2	1	1
CO4	1	1	1	1	1	2	1	1	1	1	1	-	1	2	1
CO5	1	2	1	2	2	1	2	1	-	1	-	2	1	1	2
Average	**1.2**	**1.6**	**1.2**	**1.4**	**1.8**	**1.4**	**1.4**	**1**	**1.34**	**1.2**	**1**	**2**	**1.4**	**1.4**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Irrigation Engineering

Course Code: A101606

Semester: 6th

Credits: 03 **L T P**

3 0 0

Course Outcomes:On the successful completion of this course, students will be able to:

CO	Statement
CO1	Learn concepts of irrigation and different hydraulic structures.
CO2	Estimate the quantity of water required by crops.
CO3	Plan and design irrigation projects
CO4	Design channels and other irrigation structures required for irrigation, drainage, soil
CO5	Know about conservation, flood control and other water

Course Contents

UNIT I

INTRODUCTION: Importance of Irrigation Engineering, purposes of Irrigation,

objectives of Irrigation, Benefits of Irrigation, Advantages of various techniques of irrigation--Furrow Irrigation, Boarder strip Irrigation, Basin Irrigation, Sprinkler Irrigation , Drip Irrigation.

METHODS OF IRRIGATION: Advantages and disadvantages of irrigation, water

requirements of crops, factors affecting water requirement, consumptive use of water, water depth or delta , Duty of water, Base Period, relation between delta, duty and base period, Soil crop relation-ship and soil fertility.

UNIT II

CANAL IRRIGATION: Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, Silt theories-Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's &Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy &Lacey's theories.

LINED CANALS: Types of lining, selection of type of lining, Economics of lining, maintenance of lined canals, silt removal, strengthening of channel banks, measurement of discharge in channels, design of lined canals, methods of providing drainage behind lining.

UNIT III

LOSSES IN CANALS, WATER LOGGING AND DRAINAGE: Losses in canals-

Evaporation and seepage, water logging, causes and ill effects of water logging anti water

logging measures. Drainage of land, classification of drains - surface and subsurface drains Design considerations for surface drains, Advantages and maintenance of tile drains.

INVESTIGATION AND PREPARATION OF IRRIGATION PROJECTS: Classification of project, Project preparation-investigations, Design of works and

Drawings,concept of multi - purpose projects, Major, Medium and miner projects, planning of an irrigation project, Economics & financing of irrigation works. Documentation of project report.

UNIT IV

TUBE - WELL IRRIGATION: Types of tube wells - strainer type, cavity type andslotted type. Type of strainers, Aquifer, porosity, uniformity coefficient, specific yield &specific retention, coefficients of permeability, transmissibility and storage. Yield or discharge of a tube well, Assumptions,Theim's & Dupuit’s formulae, Limitations of Theism’s and Dupuit's formulae. Interference of tube wells with canal or adjoining tube-wells, causes of failure of tube wells, optimum capacity, Duty and delta of a tube well. Rehabilitation of tube well.

RIVER TRAINING WORKS: Objectives, classification of river-training works, Design of Guide Banks. Groynes or spurs - Their design and classification ISI. Recommendations of Approach embankments and afflux embankments, pitched Islands, Natural cut-offs and Artificial cut-offs and design Considerations.

Reference Books:

1. Sharma, S.K.(2017).*Principles & practice of Irrigation Engg* S. Chand Limited.
2. Punmia, B.C. Lal, Pande B.B. (2009).*Irrigation & Water Power Engg*. Laxmi Publications (p) Ltd
3. Singh, Bharat.(2004).*Fundamentals of Irrigation Engg*. Nem Chand & Bros
4. Sahasrabudhe, S.R. (1991).*Irrigation Engg. & Hydraulic Structure* S. K. Kataria & Sons
5. Ivan E. Houk *(2009). IrrigationEngg. Vol. I & II*.John Wiley and Sons.
5. Singh,Bharat (2003). *FundamentalsofIrrigationEngg*. Swan Publications.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	2	3	2	3	2	-	2	-	-	1	2	3	2	3
CO2	2	1	2	1	2	1	2	1	2	-	2	1	2	1	2
CO3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO4	3	2	3	2	3	2	3	2	3	2	-	2	3	2	3
CO5	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1
Average	**2**	**1.6**	**2**	**1.6**	**2**	**1.6**	**1.75**	**1.6**	**1.75**	**1.67**	**1.25**	**1.6**	**2**	**1.6**	**2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Human Relations at Work

Course Code: 100307

Semester: 6th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Realize the importance of human values.
CO2	Understand that excessive desires of the mind make a person unethical and restless, while fewer desires lead to peace and professional progress
CO3	Assess different types of risks involved in unethical practices. Know various means of protesting against unethical practices.
CO4	Know the benefits of restraining from unethical practices like bribery, extortion, nepotism, nexus between politicians and industrialists.
CO5	Summarize case studies of ethical violations in Chernobyl meltdown, Challenger disaster, Ford Pinto design,and Kingfisher Airlines financial misappropriation.

Course Contents

UNIT I

Introduction To Terminology In Ethics: Integrity, Honesty, Courage, Empathy, Personality, Character, Self-Confidence, Respect for Others – Work culture, Social responsibility, Responsibilities as a citizen, Cooperation and commitment – Religion vs. Spirituality, Philosophy, Customs and practices – Self-interest, Fear, Deception, Ignorance, Ego, Uncritical acceptance of authority.

UNIT II

Mind and Its Mysteries: What is Mind? Mind and body, Mind and food – Mental faculties – Theory of perception, Memory, Imagination, Thought-Culture, Desires – Cultivation of Virtues, Control of Senses and Mind – Concentration, Meditation and Enlightenment.

UNIT III

Risk and Safety In Engineering: Estimating risk – What is acceptable risk? – Engineer's liability, Changing legal rights of the employees by non-participation, by protest – Environmental laws and judicial intervention in related matters.

UNIT IV

Case Studies – Variety of Moral Issues in Profession: Chernobyl nuclear disaster, Fukushima reactor meltdown, Challenger blowup, Ford Pinto design, Highway safety, Kingfisher Airlines financial misappropriation.

Reference Books:

1. Harris,Charles. Micheal , J.2013. *Engineering Ethics*. Cengage Learning Pub.
2. Mike, Martin. &Roland, Schinzinger.2014.*Ethics in Engineering*. McGraw Hill Pub.
3. Sivananda, Swami.*Mind Its Mysteries and Control*. Divine Life Society Pub.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	3	2	1	3	2	1	2	1	-	2	-	2	1	2
CO2	1	1	1	3	1	1	-	1	2	-	1	-	1	2	1
CO3	3	1	1	1	3	2	1	2	1	-	-	2	2	1	2
CO4	1	3	2	3	1	1	-	2	1	1	-	2	2	1	2
CO5	3	3	2	1	3	2	1	1	2	1	1	1	1	2	1
Average	**2.2**	**2.2**	**1.6**	**1.8**	**2.2**	**1.6**	**1**	**1.6**	**1.4**	**1**	**1.34**	**1.67**	**1.6**	**1.4**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Water Quality Engineering

Course Code: 101708

Semester: 7th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Understand the impact of humans on environment and environment onhumans
CO2	Identify and value the effect of the pollutants on the environment: atmosphere, water andsoil.
CO3	Plan strategies to control, reduce and monitorpollution.
CO4	Select the most appropriate technique for the treatment of water, wastewater solid waste and contaminatedair.
CO5	Become conversant with basic environmentallegislation

Course Contents

UNIT-I

Water Quality: Physical, chemical and biological parameters of water- Water Quality requirement - Potable water standards -Wastewater Effluent standards -Water quality indices.

UNIT-II

Water purification systems in natural systems: Physical processes-chemical processes and biological processes-Primary, Secondary and Tertiary treatment-Unit operations-unit processes.

UNIT-III

Sedimentation: Types, Aeration and gas transfer, Coagulation and flocculation, coagulation processes - stability of colloids - destabilization of colloids transport of colloidal particles, Clariflocculation.

UNIT-IV

Filtration : theory of granular media filtration; Classification of filters; slow sand filter and rapid sand filter; mechanism of filtration; modes of operation and operational problems; negative head and air binding; dual and multimedia filtration, pressure filters, principle of working and design.

UNIT-V

Theory of disinfection: Factors affecting disinfection, Disinfection - chlorine dioxide; chloramines; zonation; UV radiation.

UNIT-VI

Miscellaneous methods: Ion Exchange-processes, Application of Membrane Processes, Reverse Osmosis, Micro-filtration, Nano-filtration, Ultra filtration and Electrodyalisis.

Reference Books:

1. Weber, W.J. 1983.*Physicochemical processes for water quality control*. John Wiley and sons, New york.
2. Peavy, H.S. Rowe, D.R. & Tchobanoglous, G. 1985.*Environmental Engineering*. McGraw Hills, New York
3. Metcalf & Eddy, 2003.*Wastewater Engineering, Treatment and Reuse*. Tata McGraw- Hill Publication, New Delhi,
4. Sastry, C.A. Fair &Gayer. 1996. *Water & Waste Water EngineeringWater Treatment Plants*, Narosa Publishing House. Bombay.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	1	2	2	1	1	2	2	1	2	2	1	2	1
CO2	2	1	2	1	2	2	2	2	1	2	1	2	2	1	2
CO3	1	2	1	1	2	1	1	1	2	1	1	2	2	1	1
CO4	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1
CO5	1	2	1	2	2	1	2	1	2	1	2	2	1	1	2
Average	**1.2**	**1.6**	**1.2**	**1.4**	**1.8**	**1.4**	**1.4**	**1.4**	**1.6**	**1.2**	**1.4**	**1.8**	**1.4**	**1.4**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Design of Concrete Structure

Course Code: 101709

Semester: 7th

Credits: 03 **L T P**

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	**Statement**
CO1	Identify and compute the main mechanical properties of concrete and steel.
CO2	Calculate the design loads and distribution
CO3	Apply the strength method to design R.C. structural members.
CO4	Analyze and design R.C. beams for flexure and shear.
CO5	Use relevant ACI Code provisions to ensure safety and serviceability of structural elements

Course Contents

Note:Use of relevant Indian Standards is allowed.

UNIT-I: Strength and behaviorofconcreteandsteel,Assumptionsmadeintheory ofRCC.Principle ofdesignofflexuralmembersby workingstressandLimitStateMethods.

Note:AlldesignandanalysisusingLimitStateMethodforfollowingtopics.

UNIT-II: Analysisofbeams:

MomentofResistanceofsingly,doubly andflangedbeams,Designofcontinuousbeams.

UNIT-III:Analysisofshear,bondandtorsion.

UNIT-IV: Analysisofoneandtwowayslabs,Designofflatslabs,Designofcontinuousslabs

UNIT-V: CalculationofcrackinganddeflectionforLimitStateofServiceability.

UNIT-VI: Designofaxially andeccentricallyloadedcolumns.

UNIT-VII: DesignofStaircase.

UNIT-VIII: introduction to pre-stress and post-stress concreting.

Reference Books

1.Dayaratnam, P. (1983).*DesignofReinforcedConcreteStructures.* S.chand Publications.

2.Fergnson,*(1981).ReinforcedConcreteFundamentals.* New Age International (P). Ltd.

3.NilsonandWinter.(1986).*DesignofConcreteStructures.*Tata McGraw Hill Pub.co

4.Purshothaman, (2001).*ReinforcedConcreteStructuralElementsAnalysisandDesign Behavior*.Khanna Publication.

5.Pillai&Menon,*(2009).ReinforcedConcreteDesign*.Affiliated East-West Press Private Limited.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	1	2	1	2	2	1	1	-	2	1	2	-	1	2	1
CO2	2	1	2	1	2	1	2	-	-	2	1	-	2	1	2
CO3	1	2	1	1	2	1	1	1	2	1	1	2	2	1	1
CO4	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1
CO5	1	2	1	2	2	1	2	1	2	1	2	2	1	1	2
Average	**1.2**	**1.6**	**1.2**	**1.4**	**1.8**	**1.2**	**1.4**	**1**	**1.75**	**1.2**	**1.4**	**1.6**	**1.4**	**1.4**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Metro Systems& Engineering

Course Code: 101710

Semester: 7th

Credits: 03L T P

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Handle the design, construction, and operation of railroads and mass transit systems that use a fixed guide way.
CO2	Do tasks that include determining horizontal and vertical alignment design, station location and design, and construction cost estimating.
CO3	Design and construct airports.
CO4	Calculate for the impacts and demands of aircraft in their design of airport facilities.
CO5	Make the design, construction, and operation of railroads and mass transit systems that use a fixed guide way.

Course Contents

GENERAL: Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials

CIVIL ENGINEERING-Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations; Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems-permanent way. Facilities Management

Reference books:

1. Edwards, J. T. 2015.*Civil Engineering for Underground Rail Transport.*Elsevier Science.

2. Rai, B. Umesh 2016. *Handbook of Research on Emerging Innovations in Rail Transportation Engineering.* IGI Global.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	2	1	2	1	2	1	-	1	2	1	-	1	2	1	2
CO2	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
CO3	2	1	1	2	2	1	1	-	-	1	-	2	2	1	1
CO4	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
CO5	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
Average	**1.6**	**1.4**	**1.8**	**1.2**	**1.6**	**1.4**	**1.8**	**1**	**1.5**	**1.4**	**2**	**1.2**	**1.6**	**1.4**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Earthquake Resistant Structures

Course Code: A101706

Semester: 7th

Credits: 03L T P

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Evaluate seismic forces for various structures as per relevant Indian standards
CO2	Design and ductile detailing of structures for seismic resistance as per Indian
CO3	Know concepts of repair of earthquake affected structures
CO4	Learn concepts of rehabilitation of earthquake affected structures.
CO5	Design the earthquake resistant structures as per IS guidelines

Course Contents

UNIT-I

Introduction to Earthquakes, Causes of earthquakes, basic Terminology, Magnitude, Intensity, Peak ground motion parameters. Past earthquakes and Lessons learnt.

UNIT-II

Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.

Lateral Force analysis, Floor Diaphragm action, Moment resisting frames, shear walls.

UNIT-III

Concepts of seismic design, Lateral Strength, stiffness, ductility and structural configuration.

Provision of IS 1893 for buildings.

UNIT-IV

Seismic Design of Masonry Structures, Provision of IS 4326

Seismic Design and Detailing of R.C.C. buildings, Provision of IS 13920.

Reference books:

1. NilsonandWinter.(1986).*DesignofConcreteStructures.*Tata McGraw Hill Pub.co.
2. Purshothaman, (2001).*ReinforcedConcreteStructuralElementsAnalysisandDesign Behavior.*Khanna Publication.
3. Pillai&Menon,*(2009).ReinforcedConcreteDesign.*Affiliated East-West Press Private Limited.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	3	2	3	2	3	2	-	2	3	2	-	2	3	2
CO2	1	2	1	3	3	2	2	1	3	-	2	-	3	2	2
CO3	2	1	3	2	2	3	3	-	2	2	3	2	2	3	3
CO4	2	3	2	3	2	1	2	-	2	1	2	3	2	3	2
CO5	3	2	2	3	3	2	1	3	3	2	2	3	3	2	2
Average	**2.2**	**2.2**	**2**	**2.8**	**2.4**	**2.2**	**2**	**2**	**2.4**	**2**	**2.2**	**2.6**	**2.4**	**2.6**	**2.2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Foundation Engineering

Course Code: 101802

Semester: 8th

Credits: 03L T P

3 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Identify a suitable foundation system for a structure.
CO2	Evaluate the importance of raft foundation and principles of design for buildings and tower structures
CO3	Analyze and design pile foundations
CO4	Examine and discuss various machine foundations
CO5	Design Sheet piles and cofferdams

Course Contents

Shallow Foundation-I: Type of shallow foundation Depth and factors affecting it. Definition of ultimate bearing capacity, safe b.c. and allowable b.c. Rankine's analysis and Terzaghi's analysis. Types of failures. Factors affecting bearing capacity. Skemptons equation. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration Test. Their procedure, merits and demerits Factors affecting 'N' value Corrections to be applied to observed value. Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams. Newmarks chart and its construction. Two - to - one method of load distribution. Comparison of Bosussinesq and westerguard analysis for a point load. Limitations of elastic formula

Shallow Foundation-II: Contact pressure Distribution. Causes of settlement of structures, comparison of Immediate and consolidation settlement calculation of settlement by plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S.Code. Situation most suitable for provision of rafts. Proportioning of rafts in sand-sand Clays. Various methods of designing raft. Floating foundation.

Soil Investigation: Object of soil investigation for new and existing structures.Depthof exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sample affecting sample disturbance. Essential features and application of the various types of samples. Geophysical exploration by seismic and resistivity methods. Bore Hole log for S.P.T

Pile Foundations–I: Necessity and uses of piles classification of piles. Merits and demerits of different types based on composition. Types of pile driving hammers & their comparison. Effect of pile driving on adjacent ground. Use of engineering News Formula and Hailey's Formula for determination of allowable load. Limitations of pile driving formulae. Pile load test– object, pre- requisites, test arrangement, procedure and assessment of safe load. Separation of skin friction and point resistance using cyclic pile load test date. Related numerical problems.

Pile Foundation–II: Determination of point resistance and frictional resistance of a single pile by Static formulas. Pilesin Clay-Safe load on a Friction and point Bearing pile. Pile in sand Spacing of piles in a group. Efficiency of pile group by converse – Labare formula. Bearing capacity of a pile group in clay by block failure and individual action approach. Calculation of settlement of friction pile group in clay using the following equation.

$S=HxC_CLog_{10}(Sigma+delSigma)$

$1+e_oSigma$

Related Numerical problems. Settlement of pile groups in sand Negative skin friction.

Caissons and Wells: Major areas of use of caissons advantages and disadvantages of open box and pneumatic caissons. Essential part of a pneumatic caisson. Components of a well foundation. Calculation of allowable bearing pressure. Conditions for stability of a well, Terzaghi's analysis for lateral stability for a light well– embedded in sand. Modification of the analysis for a heavy well. Forcesacting on a well foundation. Computation of scour depth.

Earth Pressure: Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium and derivations of expressions for K_a and K_p for horizontal backfills. Rankine's theory both for active and passive earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Rankine's Earth pressure for a cohesionless backfill with sloping surface (withproof) concept of active and passive Earth pressure on the basis of stability of a sliding wedge. Coulomb's method for cohesion less backfill. Merits and demerits of Ranking and Coulomb's theories graphical construction and Rebhan's graphical construction (withoutsurchargeload).

Reference Books:

1. Arora, K.R.(2005). *Soil Mechanics & Foundation Engg*. Khanna Publishers. New Delhi.
2. Purshotama , Raj.(2005).*Geotechnical Engineering.* Swan Publications.
3. Murthy,V.N. (2002). Soil Mech & Foundation Engg. Cbs Publishers & Distributors Pvt. Ltd.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	3	3	2	3	2	3	2	3	2	-	2	3	2	3	2
CO2	1	2	1	2	-	2	2	3	-	2	2	3	3	3	2
CO3	2	3	3	1	2	3	3	2	2	-	-	2	2	2	3
CO4	2	1	2	3	2	3	2	1	2	3	-	3	2	3	2
CO5	3	2	2	2	3	2	1	3	-	2	2	3	3	3	2
Average	**2.2**	**2.2**	**2**	**2.2**	**2.3**	**2.6**	**2**	**2.4**	**2**	**2.3**	**2**	**2.8**	**2.4**	**2.8**	**2.2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Rock Mechanics

Course Code: 101803

Semester: 8th

Credits: 02L T P

2 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Understand the properties (viz., physical, mechanical) of rocks and failure criterion of rock mass.
CO2	Use engineering rock mass classification (RMR, Q-system, RQD)
CO3	Analyze the stress distribution in situ and around an opening in underground structures (viz., mine openings, tunnels).
CO4	Determine the relation between strain and displacement components of rock mass.
CO5	Perform field Instrumentation techniques and laboratory studies.

Course Contents

UNIT-I

1. **General Geology:**
   Importance of Engg. Geology applied to Civil Engg. Practices. Weathering, definition, types and effect. Geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition.

2. **Rocks & Minerals:**
   Minerals, their identification igneous, sedimentary & metamorphic rocks. classification of rocks for engineering purposes. Rock quality designation (ROD)

UNIT-II

3. Structural Geology:
Brief idea about stratification, apparent dip, true dip, strike and in conformities. Folds, faults & joints: definition, classification relation to engg., Operations.

4. Engineering Geology:
Geological considerations in the Engg. Projects like tunnels, highways, foundation, dams, and reservoirs. Earthquake: Definition, terminology, earthquake waves, intensity, recording of earthquake.

UNIT-III

5. Engineering properties of rocks and laboratory measurement:
Uniaxial compression test, tensile tests, permeability test, shear tests, size and shape of specimen rate of testing. Confining pressure, stress strain curves of typical rocks. Strength of intact and fissured rocks, effect of anisotropy, influence of effect of pore fluid type unsaturated and temperature.

UNIT-IV

6. In-situ determination of Engg. Properties of Rock masses :
Necessity of in-sity tests, Uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses bore hole inercoring technique-bore hold deformation gauges.

7. Improvement in properties of Rock masses :
Pressure grouting for dams and tunnels, rock reinforcement rock bolting.

Reference Books:

1. Goodman,Richard E. (1989).*Introduction to Rock Mechanics.*Cbs Publishers & Distributors Pvt. Ltd.

2. Jaager C,(1979). *Rock Mechanics and Engg.* George Allen & Unwin Publishers.

3. D.S.Arora, (1983).*Engineering Geology*. Khanna Publishers. New Delhi.

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3
CO2	3	3	2	1	3	2	-	3	2	1	-	2	1	3	2
CO3	2	1	3	2	1	3	2	1	-	2	1	3	2	1	3
CO4	1	3	2	1	3	2	-	3	2	1	3	2	1	3	2
CO5	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3
Average	**2**	**1.8**	**2.6**	**1.6**	**1.8**	**2.6**	**2**	**1.8**	**2.5**	**1.6**	**1.5**	**2.6**	**1.6**	**1.8**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Design of Steel Structures

Course Code: 101804

Semester: 8TH

Credits: 04L T P

4 0 0

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Learn the basic elements of a steel structure
CO2	Know the fundamentals of structural steel fasteners
CO3	Design basic elements of steel structure like tension members
CO4	Understand the basic design elements of steel structure like compression members
CO5	Rationalize design basic elements of steel structure like beams

Course Contents

Note: Use of relevant Indian Standards is allowed.

UNIT-I

1. Allowable stresses in direct tension, compression, bearing and shear in structural steel.

2. Riveted, Bolted and Welded connection for axial loads.

UNIT-II

3. Design of Tension and Compression Members

4. Design of steel Beams, Purlins and Encased Beams

UNIT-III

5. Design of Built up Columns under Axial Loading using Lacing and Battening Systems.

6. Design of Column Bases under direct and eccentric Loads (Slab Base, Gusseted Base and Grillage foundation)

UNIT-IV

7. Design of Steel Roof Truss: design of members for the given loads, design of riveted and welded connections, detailed working drawings.

8. Design of Plate Girder for static loads (UDL or Concentrated Loads at fixed points)

Reference books:

1. Nilson and Winter.(1986). *Design of Concrete Structures.*Tata McGraw Hill Pub.co.
2. Purshothaman, (2001).*Reinforced Concrete Structural Elements Analysis and Design Behavior.* Khanna Publication.
3. Pillai &Menon,*(2009).Reinforced Concrete Design.*Affiliated East-West Press Private Limited.

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PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	2	1	3	2	1	3	2	1	-	2	1	3	2	1	3
CO2	3	3	2	1	3	2	1	-	2	1	-	-	1	3	2
CO3	2	1	3	2	1	3	2	1	-	2	1	-	2	1	3
CO4	3	3	2	1	3	2	1	3	2	1	-	2	1	3	2
CO5	1	1	3	2	1	3	2	1	2	2	1	1	2	1	3
Average	**2.2**	**1.8**	**2.6**	**1.6**	**1.8**	**2.6**	**1.6**	**1.5**	**2**	**1.6**	**1**	**2**	**1.6**	**1.8**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Design of Concrete Structures-II

Course Code: 101805

Semester: 8th

L T P

Credits: 03 **3 0 0**

Course Outcomes: On the successful completion of this course, students will be able to:

CO	Statement
CO1	Learn basic structural analysis, design philosophies viz working stress and limit state method.
CO2	Analyze the design of concrete structures such as water tanks, RC bridges, Silos and bunker, arches and shells
CO3	Have knowledge of design codes and handbooks followed in India.
CO4	Understand a few practical aspects of design with an aim of future career possibilities.
CO5	Know a few practical aspects of design with an aim of future career possibilities.

Course Contents

Note:

1. Use of Indian Standards is allowed.

2. All Designs by Limit State Method.

UNIT-I

1. Design of isolated footing, square,circular and rectangular.

2. Design of Combined Footing: Trapezoidal and Rectangular, Design of strap and Raft Footing.

UNIT-II

3. **Beams curved in Plan:** Design of Semi Circular Beams Supported on Two Supports and Three Supports, Design of Circular Beams Supported on Symmetrically Placed Columns, Torsion in Circular Beams.

4. **Domes:** Introduction of Different types of Domes. Design of Spherical and Conical domes, Design of Cylindrical Shells Supported on Edge Beams.

UNIT-III

5.Water tank: General Design Requirements, Design of Circular and Rectangular Tanks Resting on Ground, Design of Underground Rectangular tanks, Different Types of Over Head Service Reservoirs, Design of

Intz Tank.

6. **Retaining walls:** Design of Cantilever and Counter fort Retaining Walls.

Reference Books

1. Dayaratnam, P. (1983).*Design of Reinforced Concrete Structures.* S.chand Publications.

2. Fergnson, *(1981). Reinforced Concrete Fundamentals.* New Age International (P). Ltd.

3. Nilson and Winter. (1986). *Design of Concrete Structures.* Tata McGraw Hill Pub.co

4. Purshothaman, (2001).*Reinforced Concrete Structural Elements Analysis and Design Behavior.* Khanna Publication.

5.Pillai&Menon, *(2009). Reinforced Concrete Design.* Affiliated East-West Press Private Limited.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PS0 3**
CO1	2	1	1	2	1	3	2	-	-	2	-	-	2	1	3
CO2	1	3	3	1	3	2	1	2	2	1	3	2	1	3	2
CO3	2	1	1	2	1	3	2	-	3	2	2	-	2	1	3
CO4	1	3	3	1	3	2	1	2	2	1	3	2	1	3	2
CO5	2	1	1	2	1	3	2	-	3	2	1	3	2	1	3
Average	**1.6**	**1.8**	**1.8**	**1.6**	**1.8**	**2.6**	**1.6**	**2**	**2.5**	**1.6**	**2.25**	**2.3**	**1.6**	**1.8**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Soft Skills & Interpersonal Communication

Course Code: 100309

Semester: 8th

L T P

Credits: 03 **3 0 0**

Course Outcomes: On the successful completion of this course, students will be able to:

CO	**Statement**
CO1	Understand the role of communication in personal & professional success.
CO2	Develop awareness of appropriate communication strategies.
CO3	Prepare and present messages with a specific intent.
CO4	Analyze a variety of communication acts.
CO5	Ethically use, document and integrate sources

Course Contents

UNIT-I

1. Introduction to Generic Skills

   1.1 Importance of Generic Skill Development (GSD)

   1.2 Global and Local Scenario of GSD

   1.3 Life Long Learning (LLL) and associated importance of GSD.

2. Managing Self

   2.1 Knowing Self for Self Development

   Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.

   2.2 Managing Self - Physical

   Personal grooming, Health, Hygiene, Time Management

   2.3 Managing Self – Intellectual development

   Information Search: Sources of information Listening: Effective Listening

   Speaking: Effective Oral Communication

   Reading: Purpose of reading, different styles of reading, techniques of systematic reading; Note Taking: Importance and techniques of note taking

   Writing: Correspondence - personal and business

   2.4 Managing Self – Psychological

   Stress, Emotions, Anxiety-concepts and significance (Exercises related to stress management)

   Techniques to manage the above

UNIT-II

3. Managing in Team

   2.1 Team - definition, hierarchy, team dynamics

   2.2 Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background

2.3 Communication in group – conversation and listening skills

4 Task Management

3.1 Task Initiation, Task Planning, Task execution, Task close out

3.2 Exercises/case studies on task planning towards development of skills for task management

5. Problem Solving

Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving

Different approaches for problem solving.

Steps followed in problem solving.

Exercises/case studies on problem solving.

UNIT-III

6. Entrepreneurship

6.1 Introduction

Concept/Meaning and its need

Competencies/qualities of an entrepreneur

Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2 Market Survey and Opportunity Identification (Business lanning) How to start a small scale industry procedures for registration of small-scale industry

List of items reserved for exclusive manufacture in small-scale industry

Assessment of demand and supply in potential areas of growth. Understanding business opportunity

Considerations in product selection

Data collection for setting up small ventures.

UNIT-IV

7.1 Project Report Preparation

Preliminary Project Report

Techno-Economic Feasibility Report

Exercises on Preparation of Project Report in a group of 3-4 students

RECOMMENDED BOOKS

1. Soft Skills for Interpersonal Communication by S.Balasubramaniam; Published by Orient BlackSwan, New Delhi
2. Generic skill Development Manual, MSBTE, Mumbai.
3. Lifelong learning, Policy Brief (www.oecd.orf)
4. Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication
5. Towards Knowledge Society, UNESCO Paris Publication
6. Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi Human Learning, Ormrod
7. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
8. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and

Sons, New Delhi Handbook of Small Scale Industry by PM Bhandari

The mapping of PO/PSO/CO attainment is as follows:

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CO2	2	1	3	2	1	3	1	3	2	1	3	2	1	3	2
CO3	3	2	1	3	2	1	2	1	3	2	1	3	2	1	3
CO4	2	1	3	2	1	3	1	3	2	1	3	2	1	3	2
CO5	3	2	1	3	2	1	2	1	3	2	1	3	2	1	3
Average	**2.6**	**1.6**	**1.8**	**2.6**	**1.6**	**1.8**	**1.6**	**1.8**	**2.6**	**1.6**	**1.8**	**2.6**	**1.6**	**1.8**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Total Number of Courses	**64**
Number of Theory Courses	**45**
Number of Practical Courses	19
Total Number of Credits	**172**

Annexure-4

ACADEMIC INSTURCTIONS

Attendance Requirements

A student shall have to attend 75% of the scheduled periods in each course in a semester; otherwise he / she shall not be allowed to appear in that course in the University examination and shall be detained in the course(s). The University may condone attendance shortage in special circumstances (as specified by the Guru Kashi University authorities). A student detained in the course(s) would be allowed to appear in the subsequent university examination(s) only on having completed the attendance in the program, when the program is offered in a regular semester(s) or otherwise as per the rules.

Assessment of a course

Each course shall be assessed out of 100 marks. The distribution of these 100 marks is given in subsequent sub sections (as applicable).

	Internal (40)						**External (60)**	**Total**
Components	**Attendance**	**Assignment**			**MST 1**	**MST2**	**ETE**	
		A1	A2	A3				
Weightage	5	5	5	5	30	30	60	
Average Weightage	5	5			30		40	100

Passing Criteria

The students have to pass both in internal and external examinations. The minimum passing marks to clear in examination is 40% of the total marks.