

**Course Structure & Syllabus of B.Tech – Civil Engineering
Applicable for Batch: 2019-23**

**DIT UNIVERSITY
Dehradun**



**Detailed Course Structure & Syllabus
of
B.Tech – Civil Engineering**

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Year: 1st

Semester: I

Course Category	Course Code	Course Title	L	T	P	Credit
UC	HS 103	Professional Communication	2	0	2	3
UC	MA 101	Engineering Mathematics-I	3	1	0	4
UC	EE 103	Basic Electrical Engineering	3	1	2	5
UC	PY102 / PY103 / PY104	Introduction to Mechanics / Waves and Optics and Introduction to Quantum Mechanics / Introduction to Electromagnetic Theory	3	1	2	5
UC	ME 103	Engineering Graphics	0	0	3	1.5
		Total				18.5

Year: 1st

Semester: II

Course Category	Course Code	Course Title	L	T	P	Credit
UC	MA 102	Engineering Mathematics - II	3	1	0	4
UC	CH 101	Engineering Chemistry	3	1	2	5
UC	ME 105	Engineering Mechanics	2	1	2	4
UC	ME 104	Workshop Practice	0	0	2	1
UC	CS 105	Programming for Problem Solving	3	0	4	5
		Total				19

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Year: 2nd

Semester: III

Course Category	Course Code	Course Title	L	T	P	Credit
AC	CH201/HS244	Environmental Science / Indian Constitution	2	0	0	0
SC	MA201	Engineering Mathematics - III	3	1	0	4
DC	CE201	Fluid Mechanics	3	1	2	5
	CE202	Solid Mechanics	3	1	0	4
	CE203	Basic Surveying	3	0	2	4
	CE204	Water Supply Engineering	3	1	2	5
	CE205	Building Materials and Construction	2	0	0	2
AC	HS201	Aptitude & Soft Skills- 1	2	0	0	0
Total						24

Year: 2nd

Semester: IV

Course Category	Course Code	Course Title	L	T	P	Credit
HE	HS24*	Humanities Elective-1	2	0	0	2
AC	CH201/HS244	Environmental Science / Indian Constitution	2	0	0	0
DC	CE206	Structural Analysis	3	1	0	4
	CE207	Concrete Technology	3	0	2	4
	CE208	Engineering Geology	3	0	2	4
	CE209	Transportation Engineering -I	3	1	2	5
	CE211	Soil Mechanics	3	1	2	5
AC	HS204	Aptitude & Soft Skills- 2	2	0	0	0
Total						24

Humanities Elective 1

Course Code	Course Title
HS241	Education and Social Change
HS242	Introduction to Psychology
HS243	Science, Technology and Society
HS245	Ethics and Self-Awareness

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Year: 3rd

Semester: V

Course Category	Course Code	Course Title	L	T	P	Credit
DC	CE301	Waste Water Engineering	2	0	0	2
	CE302	Transportation Engineering II	3	1	0	4
	CE303	Design of Reinforced Concrete Elements	3	1	0	4
	CE304	Foundation Engineering	3	1	0	4
	CE305	Structural Analysis Lab	0	0	2	1
DE		Department Elective-1				3
		Department Elective-2				3
PRJT	CE306	Study Project	0	0	4	2
ST	CE307	Summer Training Evaluation	0	0	0	0
AC	CE308	Value Added Training	0	0	2	0
AC	HS301	Aptitude & Soft Skills- 3	3	0	0	0
Total						23

Department Elective - 1 and 2

Course code	Course Title	L	T	P
CE341	Advanced Highway Engineering	2	1	0
CE342	Environmental Risk Assessment and Disaster Management	2	1	0
CE343	Advanced Surveying	2	0	2
CE344	Building Planning & Drawing	1	0	4
CE345	Photogrammetry & Remote Sensing	2	0	2

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Year: 3rd

Semester: VI

Course Category	Course Code	Course Title	L	T	P	Credit
DC	CE309	Design of Steel Structure	3	2	0	5
	CE311	Hydraulics and Hydraulic Machines	2	0	2	3
	CE312	Design of Reinforced Concrete Structures	3	1	0	4
DE	CE34*	Department Elective-3				3
	CE34*	Department Elective-4				3
PRJT	CE313	Design/LAB Project - I	0	0	10	5
AC	CE314	Industrial Tour	0	0	0	0
AC	HS304	Aptitude & Soft Skills- 4	3	0	0	0
Total						23

Department Elective - 3 and 4

Course code	Course Title	L	T	P
CE346	Traffic Engineering and Management	2	0	2
CE347	Rock Mechanics	2	1	0
CE348	Water and Land management	2	1	0
CE349	Water Resource Engineering	2	1	0
CE351	Ground Improvement Technique	2	1	0
CE352	Air and Water Pollution	2	1	0

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Year: 4th

Semester: VII

Course Category	Course Code	Course Title	L	T	P	Credit
DC	CE401	Estimation and Costing	2	1	0	3
	CE402	Bridge Engineering	3	1	0	4
DE	CE44*	Department Elective-5				3
OE		Open Elective-1	3	0	0	3
PRJT	CE403	Design/LAB Project - II	0	0	16	8
AC	HS311	Employment Enhancement Program	2	0	0	0
UC	ME381	Entrepreneurship & Start Up	2	0	2	3
Total						24

Department Elective – 5

Course code	Course Title	L	T	P
CE441	Pavement Evaluation and Rehabilitation	2	1	0
CE442	Ground Water Engineering	2	1	0
CE443	Principles of GPS and GIS	2	0	2
CE444	Construction Planning and Management	3	0	0
CE445	River Pollution and Control	3	0	0
CE446	Soil dynamics and Machine Foundation	2	1	0
CE447	Hydraulic Structures	2	1	0

Open Elective- 1

Course code	Course Title	L	T	P
CS481	Software Quality Engineering	3	0	0
IT353	Basics of Data Science	3	0	0
IT356	Multimedia	3	0	0
EC383	Consumer Electronics	3	0	0
EC385	Analog Electronics	3	0	0
EE481	New and Renewable Energy Sources	3	0	0
ME342	Composites Materials	3	0	0
ME445	Total Quality Management	3	0	0
PE481	Fuel Technology	3	0	0
PE482	Health Safety and Environment in Industry	3	0	0
MA451	Statistical Techniques & their application	3	0	0
AR481	Graphics & Product Design	3	0	0

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Year: 4th

Semester: VIII

Course Category	Course Code	Course Title	L	T	P	Credit
IP/THESIS	CE407	Industrial Project/Thesis				16
OR						
DC	CE405	Earthquake Engineering	2	1	0	3
	CE406	Hydrology	2	0	0	2
DE & OE	CE44*	Department Elective-6				3
		Open Elective-2	3	0	0	3
		Open Elective-3	3	0	0	3
HE	HS44*	Humanities Electives 2	2	0	0	2
Total						16

Department Elective – 6

Course code	Course Title	L	T	P
CE448	Pre-stressed Concrete	2	1	0
CE449	Environmental Management & Sustainable Development	3	0	0
CE451	River Engineering	2	1	0
CE452	Hydro Power Engineering	2	1	0
CE453	Port & Harbour Engineering	2	1	0
CE454	Structural Geology	2	0	2
CE455	Statistical Approach to Environmental Data Analysis	2	0	2
CE456	Advanced Structural Design	2	1	0
CE457	Finite Element Analysis	2	1	0

Humanities Elective 2

Course Code	Course Title
HS493	Indian Culture & Tradition
HS483	Indian Philosophy
HS491	Industrial Sociology
HS485	Sustainable Development

Open Elective- 2 and 3

Course code	Course Title	L	T	P
CS482	Human Computer Interaction	3	0	0
IT357	Internet of Things	3	0	0
IT359	Mobile Computing and Services	3	0	0
EC386	Fundamental of communication & Networks	3	0	0

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EC382	Biomedical Instrumentation	3	0	0
EE485	Basic Instrumentation & Process Control	3	0	0
ME382	Ergonomics and Value Engineering	3	0	0
ME366	Product Design and Development	3	0	0
ME452	Renewable Energy Sources	3	0	0
PE491	Carbon Capture and Sequestration Technology	3	0	0
MA452	Optimization Techniques	3	0	0
AR485	Art Appreciation	3	0	0
PY481	Nano scale science and technology	3	0	0

Summary of the Credit

Year	Semester	Credit
1	1	19
	2	18.5
2	3	24
	4	24
3	5	23
	6	23
4	7	24
	8	16
Total		171.5

Category wise classification of the Credit

Category	Credits	No. of Subjects
AC	0	9
DC	81	22
DE	18	6
HE	4	2
IP/THESIS	16	1
OE	9	3
PRJT	15	3
SC	4	1
ST	0	1
UC	40.5	11
Grand Total	171.5	59

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Subject Code	HS103	Subject Title	Professional Communication						
LTP	2-0-2	Credit	3	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

Course Objective:

To develop the LSRW skills of students for effective communication, to equip the students for business environment, to prepare the students understand and present themselves effectively

Course Pre/Co- requisite (if any):

UNIT 1: Communication

Communication: Meaning, Types of Communication: General and Technical Communication. Knowledge and adoption of Non Verbal cues of communication: Kinesics, Proxemics, Chronemics, Oculistics, Haptics, Paralinguistics. Barriers to Communication, Overcoming strategies.

UNIT 2: Listening & Speaking Skills

Listening Comprehension: identifying General and Specific information, Note taking and drawing inferences. Introduction to Phonetics: Articulation of consonants and vowel sounds.

UNIT 3: Reading Skills & Technical Writing Skills

Reading Strategies and Vocabulary Building Reading Comprehension. Paragraph development. Intra office Correspondence: Notice, Agenda, Minutes and Memorandum. Technical Proposal & Report.

UNIT 4: Business Letter Writing

Business Letter Writing, Job Application Letter & Resume, Interview Skills, Impression Management, Swot Analysis (Identifying Strength & Weakness), EQ and Its Dimensions

Learning Outcome

At the end of the course, the student will be able to:

- CO1. Communicate smoothly
- CO2. Write formal documents
- CO3. Present themselves effectively

Text book [TB]:

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005.
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.

Reference Books [RB]:

1. Aslam, Mohammad. Introduction to English Phonetics and Phonology Cambridge.2003.
2. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013.
3. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.
1. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010.
2. Tyagi, Kavita & Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011.

List of Experiments:

1. Neutralization of Mother Tongue Influence through manner of articulation, Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
2. Listening (Biographies through software) & Presentation of Biographies
3. Listening & Role Play on Situational/ Telephonic Conversation (through software)
4. Picture presentation
5. Public Speaking
6. Group Discussion
7. Case Studies
8. SWOT analysis
9. Interview
10. Final evaluation

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Subject Code	MA101	Subject Title	Engineering Mathematics-I						
LTP	3-1-0	Credit	4	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

Course Objective:

To introduce the fundamentals in Differential, Integral and Vector Calculus, use of tools for solving engineering problems.

Course Pre/Co- requisite (if any):

UNIT 1: Limit, Continuity and Differentiability

Review of Limit, Continuity and Differentiability; Indeterminate forms, L' Hospital's rule, Rolle's Theorem, Mean Value theorem and its applications, Successive Differentiation, Leibnitz's Theorem, Taylor's and Maclaurin's Series, Maxima and Minima, Asymptotes, Curvature, Evolutes, Involutives, Sketching of curves.

UNIT 2: Multivariable calculus (Differentiation)

Limit, Continuity, Partial Derivatives, Euler's Theorem, Total Derivatives, Taylor's series, Maxima and Minima, Method of Lagrange's multipliers.

UNIT 3: Multiple Integral

Review of indefinite and definite integrals and its application to evaluate surface area and volume of revolutions, Beta and Gamma functions and their properties, Double integral, Change of order of integration, Change of variables, triple integral, Dirichlet's integral and their applications.

UNIT 4: Vector Calculus

Scalar and Vector functions, fields, Gradient and its applications, Directional derivative, Divergence and Curl and their applications. Line integral, Surface integral, Statement of Green's Theorem, Volume integral, Statements of Stokes and Divergence Theorems and their applications.

Learning Outcome

At the end of the course, the student will be able to:

CO1. Learn techniques in calculus, multivariate analysis and linear algebra.

CO2. Equip the students with standard concepts and tools for tackling advanced level of mathematics and applications.

CO3. Familiarity with fundamental tools of Differential, Integral and Vector Calculus.

Text book [TB]:

1. G. B. Thomas Jr. and R. L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson Education, 2017.
2. R. K. Jain and S. R. K. Iyenger, Advanced Engineering Mathematics, 2nd Edition, Narosa Publishing House, New Delhi, India, 2014.

Reference Books [RB]:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publication, New Delhi, India, 2012
2. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, U.K., 2006.

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Subject Code	EE103	Subject Title	Basic Electrical Engineering						
LTP	3-1-2	Credit	5	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

Course Objective:

- To apprise students about electric charge, current, voltage and various circuit laws involved in analysis.
- To get acquainted with the basic idea of Generation, Transmission and Distribution of Electrical energy.
- To provide the basic knowledge of operation and working of different types of electrical equipment and their applications.

Course Pre/Co- requisite (if any):

UNIT 1: D.C. Network Theory

Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star – delta transformation, Magnetic Circuits.

UNIT 2: A.C. Circuits & Measuring Instruments

Single Phase A.C.: Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.

Three Phase A.C.: Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 3 wire system.

Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT 3: Power System & Transformers

Single line diagram of simple power system.

Single phase Transformer: Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation, O.C. and S.C. tests.

UNIT 4: D.C. & Synchronous Machines

D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, characteristics, Losses and efficiency, Need of starter in d.c. motors.

Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT 5: Induction Motors

Three Phase Induction Motors: Principle of operation of 3- ϕ induction motor, Types of 3- ϕ induction motor, Need of starters in 3- ϕ induction motors, Slip – torque characteristics

Single Phase Induction Motor: Principle of operation of single phase induction motor by double revolving field theory, Methods of starting of single phase induction motor.

Learning Outcome

At the end of the course, the student will be able to:

CO1. Students will be familiar about electrical charge, current, voltage and various basic electric circuit laws.

CO2. Acquaint students about DC circuit analysis and methods

CO3. Advanced approach for solving series parallel network of resistors by star delta transformation.

CO4. Acknowledge students with the use of transformers and its working.

CO5. To build an ability amongst students regarding the functioning of DC machines and its characteristics.

CO6. Students will recognize the need for synchronous machine in our electrical systems, its basic functioning and various advantages over other types of machines.

Text book [TB]:

1. V. Del Toro. "Principles of electrical Engineering", Prentice hall International.
2. J. Nagrath, "Basic Electrical Engineering", Tata Mc Graw Hill.

Reference Books [RB]:

1. W.H. Hayt & J.E. Kemmerly, "Engineering circuit Analysis", Mc Graw Hill.

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2. H. Cotton, “Advanced Electrical Technology” Wheeler Publishing.

List of Experiments:

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

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Subject Code	PY102	Subject Title	Introduction to Mechanics						
LTP	3-1-2	Credit	5	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

This course starts with the basic concepts of work, energy and collisions between particles. The course then covers the angular motion of bodies and moment of inertia, elasticity, fluid motion, laws of gravitation.

Course Objective:

Mechanics lies at the foundation of physics and along with an appreciation of the molecular structure of matter exposes the student to the phenomenology of physics.

Course Pre/Co- requisite (if any) :

Detailed Syllabus

UNIT 1

8 L

Transformation of scalars and vectors under Rotation transformation; Newton's laws and its completeness in describing particle motion, Cylindrical and spherical coordinates

Mechanics of a system of particles, conservation of laws of linear momentum, angular momentum and mechanical energy, centre of mass and equation of motion, Constraints and degrees of freedom.

UNIT 2

8 L

Potential energy function; $F = - \text{Grad } V$, Equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum and areal velocity; Elliptical, parabolic and hyperbolic orbits

UNIT 3

6 L

Non-inertial frames of reference; Rotating frames of reference, Coriolis force; Applications: Weather systems, projectile motion

UNIT 4

8 L

Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance, Kater's Pendulum and bar pendulum

UNIT 5

8 L

Rotation of rigid body, Moment of Inertia, Torque, angular momentum, kinetic energy of rotation, Theorems of perpendicular and parallel axis, Moment of Inertia of rectangular rod, spherical and cylindrical bodies. Acceleration of a body moving on horizontal and inclined plane. Moment of inertia of Fly Wheel.

UNIT 6

6 L

Elastic constants- Introduction and relationship between elastic constants, Cantilever, Beam, Bending of beam, Twisting of a cylindrical body.

Learning Outcome

At the end of the course, the student can :

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CO1. To know Newton's laws of motion, potentials, conservation of energy, momentum and angular momentum, and be able to apply them to projectiles, circular motion, and gravity

CO2. Demonstrate an understanding of intermediate mechanics topics such as co-ordinate transformations, oscillatory motion, gravitation etc.

CO3. Demonstrate rigid body and rotational dynamics using the concept of angular velocity and momentum.

CO4. Understand the concept of non-inertial frames of reference, coriolis and centripetal accelerations and their applications.

Text book [TB]:

1. Mechanics – D.S. Mathur, S. Chand & Co., 2012.
2. Introduction to Mechanics – D.Kleppner & R.Kolenkow, Cambridge University Press, 2017

Reference books [RB]:

1. Analytical Mechanics, G.R. Fowles and G.L. Cassiday., Cengage Learning India Pvt. Ltd., 2006
2. Introduction to Special Relativity, R. Resnick, John Wiley and Sons, 2007
3. Principles of Mechanics — J.L. Synge & B.A. Griffiths, Andesite Press, 2015

SR.NO.	LIST OF EXPERIMENTS
1	To measure internal diameter, external diameter and depth of a vessel using vernier calipers
2	To measure density of a wire using screw gauge.
3	To determine the Moment of Inertia of a Flywheel
4	To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method)
5	To determine the Modulus of Rigidity of a Wire by Maxwell's needle
6	To determine the elastic Constants of a wire by Searle's method
7	To determine the value of g using Bar Pendulum
8	To measure the Young's Modulus using Bending of Beam
9	To determine the value of g using Kater's Pendulum
10	To determine the moment of inertia of a body using Torsion pendulum

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Subject Code	PY103	Subject Title	Waves and Optics and Introduction to Quantum Mechanics						
LTP	3-1-2	Credit	5	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

This course develops a strong background of simple harmonic motion, their superposition, wave motion, interference and diffraction, lasers, semiconductors, and introduction to quantum mechanics.

Course Objective:

The objective of this course is to develop a fundamental basis of waves, optical phenomenon, concepts of quantum mechanics and semiconductor physics which the engineering students can apply to their respective area of specialization.

Course Pre/Co- requisite (if any) : no pre-requisite

Detailed Syllabus

Unit 1: Waves

6 L

Mechanical and electrical simple harmonic oscillators (characteristics and energy), damped harmonic oscillator, forced mechanical and electrical oscillators, impedance.

Unit 2: Non-dispersive transverse and longitudinal waves

8 L

Transverse wave on a string, the wave equation on a string, harmonic waves, reflection and transmission of waves at a boundary, standing waves and their eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves (Newton formula and Laplace correction).

Unit-3: Wave Optics

10 L

Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, fringes with white light, interference in parallel thin films, Newton's rings, Fraunhofer diffraction from a single slit & N- slits, Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Unit- 4: Lasers

6 L

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, components of LASER and pumping methods (in brief), different types of lasers: gas lasers (He-Ne), solid-state laser (ruby)

Unit- 5: Introduction to Quantum Mechanics

10 L

Wave nature of particles, Phase velocity, wave-packet and group velocity, Uncertainty principle and its applications, time-dependent and time-independent Schrodinger equation, physical significance of wave function., Solution of stationary-state Schrodinger equation for one dimensional problem–particle in a box,potential barrier.

Learning Outcome

At the end of the course, the student will be able to:

CO1. To acquire skills allowing the student to identify and apply formulas of optics and wave physics using course literature.

CO2.To be able to identify and illustrate physical concepts and terminology used in optics and to be able to explain them in appropriate detail.

CO3. To be able to make approximate judgments about optical and other wave phenomena when necessary.

CO4. To acquire skills allowing the student to organize and plan simpler laboratory course experiments and to prepare an associated oral and written report.

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CO5. To have basic knowledge of Quantum Mechanics and Semiconductors.

Text book [TB]:

1. The physics of vibrations and waves, H. J. Pain, Wiley, 2008
2. Optics, Ajoy Ghatak, McGraw Hill Education, 2017.
3. Solid State Electronic Devices, B.G. Streetman, Prentice Hall of India, 2015.
4. Quantum mechanics, D. J. Griffiths, Pearson Education, 2015.

Reference books [RB]:

4. Optics, E. Hecht, Pearson Education, 2008.
5. Principles of Lasers, O. Svelto, Springer Science & Business Media, 2010.
6. Semiconductor Physics and Devices, D. A. Neamen, Times Mirror High Education Group, Chicago, 2017.

SR.NO.	LIST OF EXPERIMENTS
1	(a) To determine wavelength of sodium light using Newton's Rings. (b) To determine the refractive index of a liquid using Newton's Rings.
2	To determine wavelength of sodium light using Fresnel's Biprism.
3	(a) To determine wavelength of prominent lines of mercury using plane diffraction grating. (b) To determine the dispersive power of a plane transmission diffraction grating.
4	To determine the specific rotation of cane sugar solution using bi-quartz polarimeter
5	To study the diffraction pattern of Single slit and hence determine the slit width.
6	(a) To verify cosine square law (Malus Law) for plane polarized light. (b) To study the nature of polarization using a quarter wave plate.
7	To study the variation of refractive index of the material of the prism with wavelength and to verify Cauchy's dispersion formula
8	(a) To study photoelectric effect and determine the value of Planck's constant. (b) To verify inverse square law using photocell.
9	To determine the frequency of AC mains using sonometer.
10	To determine the frequency of AC mains or of an electric vibrator by Melde's experiment
11	To measure the numerical aperture (NA) of an optical fiber.

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Subject Code	PY104	Subject Title	Introduction to Electromagnetic Theory						
LTP	3-1-2	Credit	5	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

The course develops a strong base on electrostatics and magnetostatics, Faraday's Laws, Displacement current, Electromagnetic waves

Course Objective:

To teach students the effects of electric charges at rest and in motion. Both positive and negative charges produce force field which is called "electric field". Moving charges produce current, which gives rise to another force field called "magnetic field". The electromagnetic theory studies the behavior of the electric and magnetic fields.

Course Pre/Co- requisite (if any): no pre-requisite

Detailed Syllabus

Unit 1: Electrostatics in vacuum

9 L

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Gauss law and its applications, Laplace's and Poisson's equations; Practical examples like Faraday's cage and coffee-ring effect; energy of a charge distribution and its expression in terms of electric field.

Unit 2: Electrostatics in a linear dielectric medium

7 L

Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; gauss law in dielectrics; Polarization vector, solving simple electrostatics problems in presence of dielectrics – Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field. Energy in dielectrics system

Unit 3: Magnetostatics

9 L

Electric current and current density, magnetic force, continuity equation, Bio-Savart law and its applications (straight wire and solenoid), Divergence and curl of static magnetic field; Ampere circuital law and its applications (wire, solenoid & toroid), current loop as magnetic dipole and dipole moment, Para, dia and ferro magnetic materials (properties only)

Unit- 4: Faraday's law

6 L

Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic braking and its applications; Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field.

Unit- 5: Displacement current, Magnetic field due to time-dependent electric field and Maxwell's equations

9 L

Concept of displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation; and magnetic field arising from time-dependent electric field; Maxwell's equation in integral and differential form in vacuum and non-conducting medium; transverse nature of EM wave, Wave equation in free space, Wave propagation in conducting medium and non-conducting medium & skin depth, Flow of energy and Poynting vector.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Learning Outcome

Having successfully completed this course, the student will be able to demonstrate knowledge and understanding of:

- CO1. The use of Coulomb's law and Gauss' law for the electrostatic force
- CO2. The relationship between electrostatic field and electrostatic potential
- CO3. The use of the Lorentz force law for the magnetic force
- CO4. The use of Ampere's law to calculate magnetic fields
- CO5. The use of Faraday's law in induction problems
- CO6. The basic laws that underlie the properties of electric circuit elements

Text book [TB]:

1. Introduction to Electrodynamics, David Griffiths, PHI Learning, 2012.

Reference books [RB]:

1. Physics, Halliday and Resnick, Wiley, 2013.
2. Electricity, Magnetism and Light, W. Saslow, Academic Press, 2002.

SR.NO.	LIST OF EXPERIMENTS (ANY TEN)
1	Identification of various electronic components.
2	Use of multimeter for testing diodes, LEDs, transistors and measurements of resistance, capacitance, inductance, dc voltage, dc current, ac voltage, ac current and frequency of ac mains.
3	Charging and discharging of capacitor through resistance and determination of time constant.
4	To determine the specific resistance of a given wire using Carey Foster's bridge.
5	To verify Stefan's law by electrical method.
6	To study the variation of magnetic field with distance along the axis of a current carrying coil and determination of radius of the coil.
7	To calibrate the given voltmeter using potentiometer.
8	To calibrate the given ammeter using potentiometer.
9	To determine the band gap of a semiconductor p-n junction.
10	To determine the resistance of a sample using four probe method.
11	To determine the band gap of semiconductor using four probe method.
12	To determine a unknown resistance using Wheatstone bridge.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	ME103	Subject Title	Engineering Graphics						
LTP	0-0-3	Credit	1.5	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

Course Objective:

The objectives of this course are to enable students to acquire and use engineering graphics skills as a means of accurately and clearly communicating ideas, information and instructions for technical communication.

Course Pre/Co- requisite (if any):

Detailed Syllabus

UNIT 1: Introduction to Engineering Graphics

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Involute; Scales Plain, Diagonal

UNIT 2: Projection of Points and Planes

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

UNIT 3: Projection of Solids

Projections of solids in simple position, projections of solids with axes inclined to one reference plane and parallel to other. Projections of solids with axes inclined to both of the reference plane

UNIT 4: Section of Solids and Development of Surfaces

Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone, Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone

UNIT 5: Isometric Projection and Auto CAD

Isometric Projections, Freehand Sketching, Simple and compound Solids, Conversion of Isometric Views to Orthographic Views (simple machine components according to first angle projection method), Basic AutoCAD commands & its applications

Learning Outcome

At the end of the course, the student will be able to:

CO1: Be able to use Engineering Drawing Skills as a means of accurately and clearly communicating ideas, information and instructions.

CO2: Acquire requisite knowledge, techniques and attitude for advanced study of engineering drawing.

CO3: Comprehend and draw a simple engineering drawing primarily in first angle Orthographic projections.

CO4: To create section views of simple engineering objects

CO5: To understand basic AutoCAD commands and appreciate the need of AutoCAD over Manual Drafting.

Text book [TB]:

1. N. D. Bhatt and V.M. Panchal, "Engineering Drawing", Charotar Publishing House Pvt. Ltd., 53rd edition, 2016 reprint.
2. P.S. Gill, "Engineering graphics", S. K. Kataria & Sons, 13th edition, 2016

Reference Books [RB]:

1. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
3. Narayana, K.L. & P Kannaiah (2012), Text book on Engineering Drawing, Scitech Publishers
4. D.M. Kulkarni, A.P. Rastogi, A.K. Sarkar, "Engineering Graphics with AutoCAD", PHI Learning Pvt. Ltd., 1st edition, 2009.
5. (Corresponding set of) CAD Software Theory and User Manuals

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	MA102	Subject Title	Engineering Mathematics-II						
LTP	3-1-0	Credit	4	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

Course Objective:

The objective of the course is to introduce the fundamentals in Matrices and Linear Algebra, Solving Ordinary Differential Equations, Convergence of an Infinite Series, Laplace Transform and Fourier Series relevant to engineering applications.

Course Pre/Co- requisite (if any):

UNIT 1: Linear Algebra

Matrices, Elementary row and column operations, row reduced echelon form, rank of a matrix, invertible matrices. Consistency and solution of a system of linear equations. Linear dependence and independence of vectors, Vector space and its basis, Matrix transformation, Rank-Nullity theorem, Eigen-values and eigen-vectors, Similar matrices, Cayley–Hamilton theorem and its applications. Diagonalization of matrices.

UNIT 2: Differential Equations

Methods of solving differential equations of first order and first degree, Bernoulli equation, Wronskian, Solutions of linear differential equations of higher order with constant coefficients, Cauchy-Euler linear differential equation, Solution of second order linear differential equation with variable coefficients, Method of variation of parameters. Solution of simultaneous linear differential equations of first order.

UNIT 3: Infinite Series

Introduction to sequences and series, Convergence and divergence, Series of positive terms, Comparison test, Cauchy's integral test, D'Alembert's ratio test, Cauchy's root test, Raabe's test, Logarithmic test, Alternating series, Leibnitz test.

UNIT 4: Fourier Series

Periodic functions, Fourier series of Periodic functions, Euler's formulae, Functions having arbitrary period, Change of intervals, Even and odd functions, Half range sine and cosine series

UNIT 5: Laplace Transform

Laplace Transform, Existence theorem, Properties of Laplace transform, Laplace transform of derivatives and integrals, Laplace Transform of Periodic functions, Unit Step function and Error Function, Dirac- Delta function. Inverse Laplace transform and their properties, Convolution theorem, Applications of Laplace Transform to solve linear differential equations pertaining to engineering problems.

Learning Outcome

At the end of the course, the student will be able to:

CO1. Equip the students to deal with advanced level of mathematics and applications.

CO2. Familiarity with fundamental tools of Matrices and Linear Algebra, Ordinary Differential Equations, Infinite Series, Laplace Transforms and Fourier Series.

CO3. Use of tools to solve engineering applications.

Text book [TB]:

1. R. K. Jain and S. R. K. Iyenger, Advanced Engineering Mathematics, 2nd Edition, Narosa Publishing House, New Delhi, India, 2014.
2. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books [RB]:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publications, New Delhi, India, 2012.
2. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CH101	Subject Title	Engineering Chemistry						
LTP	3-1-2	Credit	5	Subject Category	UC	Year	1 st	Semester	I/II

Course Outline:

Course Objective:

The objectives of this course are to provide a summary on water chemistry, water treatment, green chemistry and synthetic chemistry. The course intends to provide an overview of the working principles, mechanism of reactions and application of the building blocks like batteries, fuel cells, polymers and an overview of surface coatings in order to protect the metal

Course Pre/Co- requisite (if any):

UNIT 1: Water Treatment and Analysis

Standards for drinking water, Water Quality parameters, Determination of alkalinity of water, Hardness of water: Units and determination. Demineralization of water.

Softening of water: Lime soda Process, Ion exchange process, Zeolite process and RO process. Internal conditioning methods: Carbonate conditioning, Phosphate conditioning, Colloidal conditioning, Calgon conditioning. Desalination of brackish water. Numerical Problems based on all these parameters.

UNIT 2: Electrochemistry & Corrosion

Electrochemical cell, Electrode potential & EMF of a Galvanic cell, Nernst Equation, Migration of ions, Transport number, Determination of Transport number by Hittorf's method, Conductometric titrations, Types of electrode: Calomel and glass electrode, Liquid junction potential.

Corrosion and its economic aspects, Types of corrosion: Galvanic, Erosion, Crevice, Pitting, Waterline, Soil, Microbiological. Theories of corrosion: Acid, Direct Chemical attack, Electrochemical. Corrosion prevention by metallic, organic/inorganic coatings and corrosion inhibitors

UNIT 3: Polymers & Biomolecules

Introduction; Classification of Polymers; Functionality; Mechanism of Polymerization; Plastics; Individual Polymers; LDPE, HDPE, PVC, Polystyrene, Bakelite, Teflon, PMMA, PET, Nylon-6, Rubbers (BUNA-S and BUNA-N); Specialty Polymers (Conducting Polymers, Silicones and Polycarbonates), Structural and functional attributes of cell and cell organelles; Biomolecules (Proteins, Carbohydrates, Lipids, Enzymes, Nucleic acids)

UNIT 4: Fuels, Battery & Lubrication

Classification of fuels, Calorific value, Cetane number, Octane number, Comparison of solid, liquid and gaseous fuel, properties of fuel, Biofuels, Power alcohol and synthetic petrol, Battery, Metal-air battery, Lithium and nickel battery. Introduction of Lubricants, Functions of Lubricants, Classification of lubricants, Mechanisms of Lubrication, Properties of Lubricants.

UNIT 5: Green Chemistry & Nano Chemistry

Emergence of green chemistry, Twelve principle of green chemistry, use of alternative feedstock (biofuels), Use of innocuous reagents, use of alternative solvents, design of safer chemicals, designing alternative reaction methodology, minimizing energy consumption. Introduction to Nano chemistry, properties of Nano materials, preparation of nanomaterial, self-assembly, Different Nano materials, Applications of Nano materials

Learning Outcome

At the end of the course, the student will be able to:

CO1: To understand about the treatment of water, sewage water and hardness related calculation

CO2: An overview of surface coatings in order to protect the metal.

CO3: An ability to identify and formulate polymers and have a knowledge of various polymers like polythene, PVC, PS, Teflon, Bakelite, Nylon which have engineering applications. To gain acquaintance regarding

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

biomolecules and their application in Engineering. To gain acquaintance regarding biomolecules and their application in engineering.

CO4: An overview of the working principles, mechanism of reactions and application of the building blocks like batteries, fuel cells,

CO5: An ability to handle various instruments like spectroscope, flame photometer etc. Have a knowledge of synthesizing Nano materials and their applications in industry. Know the properties of Fuels and Lubricants. Have a scope in the area of Material Chemistry.

Text book [TB]:

5. Engineering Chemistry by Shikha Agarwal. Cambridge University Press Edition 2015.
6. Engineering Chemistry by S. Vairam & Suba Ramesh. Wiley India Pvt. Ltd. 2014.

Reference books [RB]:

7. Environmental Chemistry by Stanley E. Manahan. CRC Press Taylor and Francis.
8. Organic Chemistry by Morrison and Boyd. Pearson.
9. Physical Chemistry by Atkins. Oxford University Press.
10. Concise Inorganic Chemistry by J.D. Lee. Oxford University Press.
11. Basic Biotechnology by S Ignacimuthu. Tata Mcgraw-Hills
12. Spectroscopy by Silver Stein. Pearson.
13. Nano: The essentials by T. Pradeep. McGraw Hill Education.
14. Biochemistry by Stryer Lubert. Mcmillan learning. 2015.

List of Experiments:

1. Determination of alkalinity in the given water sample.
2. Estimation of temporary and permanent hardness in water sample using EDTA as standard solution.
3. To determine the percentage of available chlorine in bleaching powder.
4. To determine the chloride content in the given water sample by Mohr's method
5. Determination of iron content in the given ore by using External indicator
6. To determine the Dissolved Oxygen in a given water sample.
7. To determine the strength of unknown acid pH-metrically
8. To analyze the coal sample by proximate analysis.
9. To determine the Flash and Fire point of a fuel sample.
10. To determine the Viscosity of a lubricant by redwood viscometer.
11. To determine the rate constant and order of reaction
12. To determine the strength of a given solution conductometrically

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	ME105	Subject Title	Engineering Mechanics						
LTP	2-1-2	Credit	4	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

Course Objective:

The objectives of this course is to learn basics concepts of engineering mechanics and increase the ability to solve problems involving forces, loads and moments and to know their applications in allied subjects

Course Pre/Co- requisite (if any):

Detailed Syllabus

UNIT 1: Introduction to Engineering Mechanics

Basic idealizations - Particle, Continuum and Rigid body; Newton's laws of Force and its characteristics, types of forces-Gravity, Lateral and its distribution on surfaces, Classification of force systems, Principle of physical independence, superposition, transmissibility of forces, Introduction to SI units.

Couple, Moment of a couple Characteristics of couple, Moment of a force, Equivalent force - couple system; Numerical problems on moment of forces and couples, on equivalent force - couple system.

UNIT 2: Equilibrium of forces

Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent and non-concurrent force systems Application- Static Friction in rigid bodies in contact, Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Numerical Problems on single and two blocks on inclined planes, ladder and wedge friction.

UNIT 3: Analysis of Plane truss and Beam

Support Reaction in beams: Types of beams, Types of Loads and Supports, statically determinate beams, Numerical problems on support reactions for statically determinate beams with Point load (Normal and inclined) and uniformly distributed and uniformly varying loads and Moments.

Plane Truss: Perfect and imperfect truss Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

UNIT 4: Center of Gravity and Centroids

Introduction to the concept, Centroids of line and area, Centroids of basic geometrical figures, computing Centroids for– T, L, I, and full/quadrant circular sections.

UNIT 5: Kinetics of Particle

Newton's law of motion; Motion of bodies in Rectangular coordinates; D'Alembert's Principle.

Learning Outcome

At the end of the course, the student will be able to:

- CO1. Identify principles of mechanics to be used for solving real life engineering problems.
- CO2. Apply basic Engineering concepts based on force, shape and dimension for selection of material
- CO3. Comprehend the action of Forces, Moments and other loads on systems of rigid bodies.
- CO4. Compute the reactive forces and the effects that develop as a result of the external loads.
- CO5. Express the relationship between the motions of bodies.

Text book [TB]:

3. Engineering Mechanics by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition 2009.
4. Engineering Mechanics-Statics and Dynamics by A Nielson, Tata McGraw Hill Education Private Ltd, New Delhi, 2009.

Course Structure & Syllabus of B.Tech – Civil Engineering Applicable for Batch: 2019-23

Reference Books [RB]:

1. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education
2. Beer FP and Johnson ER, "Mechanics for Engineers- Dynamics and Statics"- 3rd SI Metric edition, Tata McGraw Hill. - 2008
5. Shames IH, "Engineering Mechanics – Statics & Dynamics"- PHI

List of Experiments:

1. Study of different types of beam.
2. Calculation and Verification of forces in truss elements.
3. Calculation and verification of equilibrium condition on beam model.
4. Calculation to find the redundant force in a truss.
5. Mechanical advantage over pulley arrangement.
6. Determining the coefficient of friction.
7. Optional Tensile Strength
8. Optional Hardness Measurement

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	ME104	Subject Title	Workshop Practice						
LTP	0-0-2	Credit	1	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

Course Objective:

Ability to prepare simple objects using machines and machine tools to make students aware of fundamental operations of manufacturing an engineering component, enhance visualization and motivate them to innovate

Course Pre/Co- requisite (if any):

UNIT 1: Machine Shop

To make a machined-component using lathe with mild steel round bar or hexagonal bar
Comprising of common turning operations with reference to drawing given in the manual.

Any one of the following jobs

Jobs: Hex Bolt, Axle for cycle wheel, Jig Bush, a typical turning specimen.

UNIT 2: Sheet metal Shop

To make a sheet metal component with galvanized iron sheet as per the drawing provided in the manual having spot welding joint.

Any one of the following jobs

Jobs: Square tray, Scoop, Funnel

Fitting Shop

To make a joint using fitting tools with mild steel flats, round bars or square bars as per the drawing provided in the manual.

UNIT 3: Welding Shop- Arc Welding

To prepare a welding joint with mild steel flat using Manual Metal Arc welding machine according to the drawing provided in the manual.

Any one of the following jobs

Jobs: Lap joint, Butt joint, Fillet/Corner joint

Gas & Spot Welding

To observe the demonstration of making a Lap joint/Butt joint with mild steel sheet using oxyacetylene flame as per the drawing provided in the manual. To perform the spot welding operation on G.I. sheet

UNIT 4: Carpentry Shop

To make a wooden joint with soft wood as per the drawing provided in the manual.

Any one of the following jobs

Jobs: T-Lap joint, Dove tail joint, Mortise & Tendon joint, Bridle joint.

UNIT 5: Foundry Shop

Introduction to foundry process like melting of metals, mould making, casting process and use of patterns to prepare of a component and significance of foundry.

Demo of mould preparation

Minor Project:

To make a minor project by the students in batches comprising the operations performed in different shops

Learning Outcome

At the end of the course, the student will be able to:

CO1: Have Capability to identify hand tools and instruments for machining and other workshop practices.

CO2: Obtain basic skills in the trades of fitting, carpentry, welding and machining

CO3: Acquire measuring skills, using standard workshop instruments & tools.

CO4: Gain eye hand co-ordination, enhance psycho motor skills and attitude.

Text book [TB]:

1. A course in Workshop Technology Vol I and Vol II by Prof. B.S. RaghuvanshDhanpat Rai & Co.(P) Ltd.
2. Elements of Workshop Technology Vol I and Vol II by S.K. Hajara Choudhury ,A.K. Hajara Choudhury & Nirjhar Roy ;Media Promoters & Publishers Pvt. Ltd, Mumbai

Reference Books [RB]:

1. WorkshopTechnology Part 1 , Part2 & Part3 by W.A.J. Chapman;CBS Publishers & Distributors, New Delhi

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CS105	Subject Title	Programming for Problem solving						
LTP	3-0-4	Credit	5	Subject Category	UC	Year	1 st	Semester	I / II

Course Outline:

Course Objective:

The objective of the course is to make the students to understand the key hardware components in a modern computer system and as to how the software is mapped to the hardware. The student shall also be able to learn make the computer programs using C language by exploring the various features of C.

Course Pre/Co- requisite (if any):

Detailed Syllabus

UNIT 1: Introduction to Computer, Programming & algorithms

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples, From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

UNIT 2: Arithmetic Expression, and Conditional statements, Loops

Expression:

Arithmetic, Logical, Relational expressions and precedence.

Loops & Branching: Writing and evaluation of conditionals and consequent branching, Iteration and loops.

UNIT 3: Arrays & Functions

Arrays: Arrays (1-D, 2-D), Character arrays and Strings.

Functions: functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference.

Searching & Sorting: 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 4: Fuels, Battery & Lubrication

Recursion:

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

Structure:

Structures, Defining structures and Array of Structures.

UNIT 5: Pointers & File handling

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list.

File handling: different modes of opening a file in C, reading, writing from files.

Learning Outcome

At the end of the course, the student will be able to:

CO1. To formulate simple algorithms for arithmetic and logical problems.

CO2. To implement conditional branching, iteration and recursion.

CO3. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

CO4. To use arrays, pointers and structures to formulate algorithms and programs.

CO5. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems

Text book [TB]:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd edition 1988, Prentice Hall of India.

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Applicable for Batch: 2019-23

List of Experiments:

1. Familiarization with programming environment.
2. Programming for Simple computational problems using arithmetic expressions.
3. Programming for Problems involving if-then-else structures.
4. Programming for Iterative problems e.g., sum of series.
5. Programming for 1-D Array manipulation.
6. Programming for Matrix problems, String operations.
7. Programming for Simple functions
8. Programming for Recursive functions.
9. Programming for Pointers and structures.
10. Programming for File operations
11. Programming for solving Numerical methods problems

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CH201	Subject Title	ENVIRONMENTAL SCIENCE						
LTP	2 0 0	Credit	0	Subject Category	AC	Year	2 nd	Semester	III

OBJECTIVE

To impart basic knowledge about the environment and its allied problems and to develop an attitude of concern for the environment. Further the course structure will create the awareness about environmental problems among students and motivate the students to participate in environment protection and environment improvement programs. The course aims to develop skills to help the concerned individuals in identifying and solving environmental problems.

Unit 1: Basics of Environment and Natural Resources:

04 Hrs

Definition and Concept of Environment, Multidisciplinary nature of environmental studies. Scope and importance of environmental studies, Need for public awareness, Environmental concerns and people. Introduction and classification of natural resources. Energy Resources, Water Resources, Land Resources, Forest Resources, Food Resources, Mineral Resources, Case studies related to over exploitation of resources and their impacts. Role of an individual in conservation of natural resources, Sustainable lifestyles.

Unit 2: Ecosystems:

04 Hrs

Definition and concept of ecology, Structure and Function of an Ecosystem, Energy Flow in Ecosystems, Biogeochemical cycles (Nitrogen, Carbon, Phosphorus, Oxygen, Hydrological). Species interactions in ecosystems. Ecological succession and ecological pyramids. Characteristic features of grassland, pond, desert and forest ecosystems. Ecosystem services and conservation.

Unit 3: Biodiversity and its conservation:

04 Hrs

Introduction and types of biodiversity. Bio-geographic classification of India, Value and significance of biodiversity, Biodiversity at global, national and local levels, India: A mega-diversity nation, Biodiversity hotspots, Threats to Biodiversity: Poaching and man-wildlife conflicts, IUCN Red Data Book and endangered & endemic species of India. Biodiversity conservation strategies, Institutes and organizations.

Unit-4 Environmental Pollutions:

05 Hrs

Introduction and Definition. Causes, consequences and control measures of: Air pollution, Water pollution, Noise pollution, Nuclear pollution, Soil pollution, Thermal and Marine pollution. Solid waste management, Bio-medical waste management. Disasters and its mitigation strategies, Global warming, Climate change, Acid rain, Ozone depletion and Smog. Pollution case studies. Role of an individual in pollution prevention.

Unit-5 Social Issues and Environment:

04 Hrs

Sustainable Development: Concept and importance, Environmental Impact Assessment (EIA), GIS, Remote sensing. Water conservation and rain water harvesting. Resettlement and rehabilitation problems, Environmental audit, eco-labeling and eco-friendly business. Environmental Legislation in India, Population explosion and its impact on environment and human health, Value Education and environmental ethics.

Field work:

03 Hrs

- Visit to a local area to document environmental asset: river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common flora and fauna.
- Study of a common ecosystem-pond, river, hill slopes, etc.

Course Outcome:

At the end of the course, the student will be able to:

- CO1. Demonstrate depleting nature of Environmental Resources and Ecosystem concepts.
CO2. Able to identify the structure and functioning of natural ecosystems.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

CO3. Establish man-wildlife harmonious relationship.

CO4. Adapt to 3R (Reuse, Recovery, Recycle). Identify the causes and control measures related to Pollutions.

CO 5. Illustrate and analyse various Case Studies related to Environmental issues and Env. Legislation.

TEXT BOOKS

1. Bharucha Erach, 2004. Textbook for Environmental Studies, University Grants Commission, New Delhi.

2. Kaushik A & Kaushik C P. 2007. Perspectives in Environmental Studies, New Age International Publ.

3. S. Deswal & A. Deswal 2015. A Basic Course in Environmental Studies. Dhanpat Rai & Co.

REFERENCES

1. Miller T.G. Jr. 2002. Environmental Science, Wadsworth Publishing Co. (TB).

2. De A.K., 1996. Environmental Chemistry, Wiley Eastern Ltd.

3. Sharma, P.D. 2005. Ecology and environment, Rastogi Publication.

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Applicable for Batch: 2019-23

Subject Code	HS244	Subject Title	INDIAN CONSTITUTION						
LTP	2 0 0	Credit	0	Subject Category	AC	Year	2 nd	Semester	III

OBJECTIVE

To familiarize the students with the features of the Indian Constitution

To provide a knowledge of their constitutional rights

Unit 1 Introduction

5 Hrs

Constitution- meaning of the term, basic features Indian Constitution: Sources and constitutional history.

Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive, Principles of State Policy, debates on Fundamental Rights and Directive. 1 Hr

Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive, Principles of State Policy, debates on Fundamental Rights and Directive. 4 Hrs

Unit 2 Union Government and its Administration

6 Hrs

Structure of the Indian Union: Federalism, Centre- State relationship, 2 Hrs

President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha 2 Hrs

Institutional Functioning: Prime Minister, Parliament and Judiciary, Power Structure in India: Caste, class and patriarchy 2 Hrs

Unit 3 State Government and its Administration

3 Hrs

Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions 3 Hrs

Unit-4 Local Administration

7 Hrs

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected, Representative, CEO of Municipal Corporation. 3 Hrs

Pachayati Raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy 4 Hrs

Unit V: Election Commission

5 Hrs

Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

COURSE OUTCOME:

CO 1 Enable the students to protect their rights

CO 2 The students will be engaged in the political system of India

TEXT BOOKS

- Abbas, H., Kumar, R. & Alam, M. A. (2011) Indian Government and Politics. New Delhi: Pearson, 2011.
- Chandhoke, N. & Priyadarshi, P. (eds.) (2009) Contemporary India: Economy, Society, Politics. New Delhi: Pearson.

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REFERENCE BOOKS

- Chakravarty, B. & Pandey, K. P. (2006) Indian Government and Politics. New Delhi: Sage.
- Chandra, B., Mukherjee, A. & Mukherjee, M. (2010) India after Independence. New Delhi: Penguin.
- Singh, M.P. & Saxena, R. (2008) Indian Politics: Contemporary Issues and Concerns. New Delhi: PHI Learning.
- Vanaik, A. & Bhargava, R. (eds.) (2010) Understanding Contemporary India: Critical Perspectives. New Delhi: Orient Blackswan.
- Menon, N. and Nigam, A. (2007) Power and Contestation: India since 1989. London: Zed Book.
- Austin, G. (1999) Indian Constitution: Corner Stone of a Nation. New Delhi: Oxford University Press.
- Austin, G. (2004) Working of a Democratic Constitution of India. New Delhi: Oxford University Press.
- Jayal, N. G. & Maheta, P. B. (eds.) (2010) Oxford Companion to Indian Politics. New Delhi: Oxford University Press.

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Applicable for Batch: 2019-23

Subject Code	MA201	Subject Title	ENGINEERING MATHEMATICS – III						
LTP	3 1 0	Credit	4	Subject Category	SC	Year	2 nd	Semester	III

Objective:

- Introduce the fundamentals in Complex variable.
- Solving Partial Differential Equations.
- Legendre polynomial of first kind with properties.
- Bessel function of first kind and its properties.

UNIT I: Complex variable- I

(8)

Elementary functions, limit, continuity & differentiability, Analytic Functions; Cauchy – Riemann equations, Harmonic functions, Line integral in the complex plane, Cauchy's Integral theorem, Cauchy's Integral formula for derivatives of analytic function.

UNIT II: Complex Variables -II

(6)

Power series, Taylor's series, Laurent's series, Poles, Zeros, Singularities, Residue Theorem, Evaluation of real

integrals of the type $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta$ and $\int_{-\infty}^{\infty} f(x) dx$.

UNIT III: Special Functions

(8)

Series solution of ODE of 2nd order with variable coefficient with special emphasis to Legendre and Bessel differential equation by Frobenius method, Legendre polynomial of first kind, Bessel function of first kind and their properties.

UNIT IV: Fourier Transform & Z-transform

(8)

Fourier integral, Fourier transform, Fourier sine and cosine transforms, Linearity, Scaling, frequency shifting and time shifting properties, Convolution theorem and its application.

Z – Transform, Properties of Z-transforms, Convolution of two sequences, Inverse Z-transform, Solution of difference equations.

UNIT V: Partial differential equations and its Applications

(8)

Introduction to partial differential equations; Linear partial differential equations with constant coefficients of second order and their classification; Method of Separation of Variables for solving Partial Differential Equations, One-Dimensional Wave Equation, One Dimensional heat equation.

Course Outcomes:

- Familiarity with methods of solving partial differential equations.
- Learn differentiation and Integration of complex functions.
- Solving real integrals with complex integration.
- Learn Fourier and Z-transform rules with applications.

Text Books:

1. J.W. Brown & R. V. Churchill: Complex Variables & Applications, 9th edition, McGraw-Hill, 2013.
2. R. K. Jain & S. R. K. Iyenger, Advanced Engineering Mathematics, 2nd Edition, Narosa Publishing House, New Delhi, India, 2014.

Reference Books:

1. B. S. Grewal, Higher Engineering Mathematics, 42th Edition, Khanna publication, New Delhi, India, 2012.
2. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, U.K., 2006.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE201	Subject Title	FLUID MECHANICS						
LTP	3 1 2	Credit	5	Subject Category	DC	Year	2 nd	Semester	III

OBJECTIVE:

The course is designed to gain knowledge regarding the flow characteristics and its effects on the Civil Engineering Structures.

Unit 1: Fluid Properties and Hydrostatics

Introduction to Fluid Mechanics, Definition of Fluid, Solid and Fluid Continuum. Definition, Units and dimensions of Mass density, Specific weight, Specific Volume, Relative density, Viscosity, Capillarity & Surface Tension. Newton's law of viscosity, Equation for capillarity. 4 L

Definition of Pressure, Hydrostatic pressure equation, Absolute and Gauge pressures. Measurement of Pressure, Force exerted by a liquid on a flat surface, concept of buoyancy. 4 L

Unit 2: Kinematics and Dynamics of Fluid Flow

Introduction, Classification of flow, Three dimensional continuity equation (Cartesian coordinates), General Continuity equation, Stream function, Velocity potential, Stream line, Equipotential line, (Two dimensional only). 4 L

Concept of inertia force and forces causing motion. Derivation of Euler's equation & Bernoulli's equation with assumptions and limitations, problems on application of Bernoulli's equation 4 L

Unit 3 Flow through Pipes

Introduction, Reynolds's number and its significance, Laminar and Turbulent Flow, Hagen- poiseulle's equation, Major and minor losses in pipe flow Equation for head loss due to friction (Darcy's), Equation for head loss due to sudden expansion 5 L

Pipes in series, pipes in parallel and equivalent pipes, Water Hammer in pipes. 3 L

Unit-4 Dimensional Analysis and Model Studies

Introduction to Dimensional analysis, Units and dimensions, Dimensional Homogeneity. Raleigh's and Buckingham's methods of analysis, 3 L

Model studies, similitude, dimensional parameters, Types of models, Froude's models: Reynold's models 4 L

Unit- 5:Flow Measurements

Introduction, Equation for discharge over triangular notch, Rectangular notch, Trapezoidal notch. Classification of orifices, Hydraulic coefficients of an orifice, Problems on Vertical Orifice. 8 L

COURSE OUTCOME:

At the end of the course, the student can:

CO1. Calculate Hydrostatic forces on bodies by applying concepts of fluid properties.

CO2. Apply knowledge of Fluid statics and Fluid dynamics in CFD analysis.

CO3. Compute major and minor losses in pipe and water hammer pressure.

CO4. Apply Knowledge of Model laws and Dimesional analysis.

CO5. Measure discharge through Notches and Orifices.

TEXT BOOKS

1. Bansal, R. K., "Fluid Mechanics and Hydraulic Machine", Lakshmi Publications, New Delhi., 2008
2. Subramanya. K., "Fluid Fluid Mechanics", Tata McGraw Hill, New Delhi.
3. Rajput, R.K., "A Textbook of Fluid Mechanics and Hydraulic Machines", S. Chand Publications, 6th Edition. 2016

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

REFERENCES

- 1 Modi, P. N., Seth, S. M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2004.
- 2 Jain, A.K., "Fluid Mechanics: Including Hydraulic Machines", Khanna Publishers, New Delhi, 2010

SR.NO.	EXPERIMENT NAME
1	Verification of Bernoulli's Theorem
2	Metacentric Height
3	Calibration of V- Notch
4	Calibration of Rectangular Notch
5	Calibration of Trapezoidal Notch
6	Calibration of Venturimeter
7	Calibration of Orificemeter
8	Losses in Pipes

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE202	Subject Title	SOLID MECHANICS						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	2 nd	Semester	III

OBJECTIVE:

The course objective is to learn the strength behavior of materials and properties of those materials used in Civil Engineering

Unit 1: Simple Stresses and Strains

Basic idealizations - Introduction, Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress – Strain diagram for structural steel and nonferrous metals, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections. Elongation due to self – weight, volumetric strains-expression, Elastic constants, relationship among elastic constants. 5 L

Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications

Unit 2: Principal Stresses and Strains

Introduction, Stress components on inclined planes, General two dimensional stress system, Principal planes and stresses, Mohr's Circle of stresses. 6 L

Unit 3: Bending Moment and Shear Force in Beams

Introduction, Types of beams, loadings and supports, Shear force and Bending moment, Sign conventions, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, SFD and BMD with salient values for cantilever beams, simply supported beams and overhanging beams for Point loads, UDL, Triangular loads and Couple. 10 L

Unit-4: Bending and Shear Stress in Beams

Introduction – Bending stress in beam, Assumptions in simple bending theory, Derivation of Bernoulli's equation for simple bending, Section modulus, Flexural rigidity, Expression for horizontal shear stress in beam, Shear stress distribution for rectangular, 'I' and 'T' sections. 8 L

Unit- 5: Deflection of Prismatic Beams & Elastic Stability of Columns

Definitions of slope, deflection, Elastic curve derivation of differential equation for flexure, Slope and deflection using Macaulay's method for simply supported and cantilever beams subjected to point loads, UDL and Couple. Elastic stability of columns- Introduction – Short and long columns, Euler's theory on columns, Effective length slenderness ratio, radius of gyration, buckling load, Assumptions, derivations of Euler's Buckling load for different end conditions, Limitations of Euler's theory, Rankine's formula and problems. 10 L

COURSE OUTCOME:

At the end of the course, the student can:

- CO1. Calculate the properties of materials, stresses and strains developed under different types of loadings and the relationship between Elastic Moduli's
- CO2. Know the types of beams with different end conditions and also to find S.F. and B.M. at any section of the beam subjected to different types of loadings.
- CO3. Determine bending stress and shear stress distribution across various beam sections
- CO4. To determine the bending and shear stresses.

TEXT BOOKS

1. Ramamrutham, S., Narayan, R., "Strength of Materials", Dhanpat Rai Publications, 14th Edition, 2011.
2. Rajput, R. K., "Strength of Materials", S. Chand Publications, 2006.
3. "Strength of Materials" by S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.

Course Structure & Syllabus of B.Tech – Civil Engineering Applicable for Batch: 2019-23

REFERENCES

1. Timoshenko, S. P., "Elements of Strength of Materials", East West Press, 2009.
2. Beer, F. P., Johnston, E. R., DE Wolf, J. J. T., "Mechanics of Materials", The McGraw Hill Companies, 3rd Edition.
3. Basavarajaiah, B. S., Mahadevappa, P., "Strength of Materials", and Orient Black swan, New Delhi, 2010.
4. Pytel, A., Singer, F. L., "Strength of Materials", Harper Collins Publications, 1990.
5. Russell C. Hibbeler, Mechanics of materials, Pearson 10th Edition, 2017

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE203	Subject Title	BASIC SURVEYING						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2 nd	Semester	III

OBJECTIVE:

The course is designed to gain knowledge about surveying and its relevance in mapping and to introduce the students with various methods of calculating areas and volumes using maps.

Unit 1: Introduction

6 L

Importance of surveying to engineers. Types and classification of survey. Concept of scale, Symbols & colours, Principles of surveying. Concept of field and office work. Horizontal and vertical control. Units of measurement. Definition of maps and understanding topographical maps of Survey of India.

Unit 2: Horizontal control

8 L

Operation and use of metric chain and tape. Sources of errors and corrections. Use of ranging rods, cross staff, arrows, pegs etc. Use of prismatic compass and - Surveyor's compass - Bearings - Whole circle and Reduced Bearing -Traversing - Local attraction - Magnetic dip and declination. Plane table survey and accessories- Radiation, intersection and traversing. Two point problem, Three point problem.

Unit 3 Vertical Control

8 L

Definitions of terms used in levelling, different types of levels, adjustments, bench marks. Booking and reducing the levels- rise and fall method and plane of collimation method. Profile levelling- longitudinal and cross sectioning – Plotting. Contouring- definition and characteristics of contours. Uses of contours. Methods of contouring-direct and indirect.

Unit-4 Theodolite Survey

12 L

Definition – types, principle and fundamental axes. Temporary adjustments. Measurements of horizontal and vertical angles. Method of repetition and Reiteration. Finding out height and elevation of object by single and double plane method. Curves: Simple curve-Elements of simple curves. Designation of a curve. Setting out simple curve Tabulation and setting out of compound curve, reverse curve, transition curve, combined curve and vertical curves.

Unit- 5:Areas and Volumes

5 L

General methods for determining areas. Areas from offsets to a base line, area by double meridian distances, coordinates, map measurements and planimeter. Measurement of volume by prismoidal and trapezoidal formula, volume from spot levels and volume from contour plans.

COURSE OUTCOME:

At the end of the course, the student can :

CO1. Identify principles of surveying to be used for solving real life engineering problems.

CO2. Know how to interpret maps in surveying.

CO3. Perform Theodolite survey for horizontal control and leveling for vertical control

CO4. Students can compute area and volume of large area using different methods for use in surveying.

TEXT BOOKS

1. Punmia, B. C., Jain, A. K., "Surveying", Laxmi Publications Pvt. Ltd., New Delhi, Vol. I, 16 th Edition, 2005.

2. Punmia, B. C., Jain, A. K., "Surveying", Laxmi Publications Pvt. Ltd., New Delhi, Vol. II, 15 th Edition, 2005.

3. Engineering Roy, S. K., "Fundamentals of surveying", Prentice Hall of India, New Delhi, 2 nd Edition, 2010.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

REFERENCES

1. Chandra, A. M., "Plane Surveying", New age International, 2nd Edition, 2006.
2. Beer FP and Johnson ER, "Mechanics for Engineers- Dynamics and Statics"-3rd SI Metric edition, Tata McGraw Hill.-2008
3. De, A., "Plane surveying", S. Chand and Company Ltd., 2000.

SR.NO.	EXPERIMENT NAME
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- | | |
|----|---|
| 1 | Study of different types of maps, their scales, latitude, longitude, colours and symbols. |
| 2 | Setting out polygons using prismatic compass; Location of details using compass traversing. |
| 3 | Method of radiation and intersection by plane tabling. |
| 4 | Two point and three point problem. |
| 5 | Finding elevations using dumpy level with change point and using plane of collimation method. |
| 6 | Plotting of contours by block levelling. |
| 7 | Finding horizontal angle by method of repetition, method of reiteration and measurement of vertical angles. |
| 8 | Finding out height and elevation of an object by single plane method. |
| 9 | Setting out simple curves by offsets from long chord & chord produced method. |
| 10 | Setting out simple curves by Rankine's deflection angle method. |

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE204	Subject Title	WATER SUPPLY ENGINEERING						
LTP	3 1 2	Credit	5	Subject Category	DC	Year	2 nd	Semester	III

OBJECTIVE:

The course provides an understanding of drinking water quality, treatment and design of treatment units, water supply and water connections to households.

Unit 1: Need for public water supply and role of engineers

6 L

Quantity of water, Different water demands, design period and population forecast-Arithmetic mean, Geometric mean and incremental increase method. Sources of water.

Unit 2: Quality of water

9 L

Physical, chemical and bacteriological water quality parameters, Standards of Water quality desired for domestic water supplies – BIS and WHO Standards - Water borne diseases.

Unit 3: Treatment of water

10 L

Objectives. Conventional treatment plant layout. Different treatment units (location and its function) - Screening, Aeration, Sedimentation, Filtration and Disinfection. Concept of flow through treatment units. Design of circular sedimentation tanks and Rapid Sand Filter. Miscellaneous treatment methods, swimming pool water treatment.

Unit-4: Storage and distribution of water

8 L

Layouts of distribution systems, Methods of distribution: pressure and gravity distribution systems, concept of service and balancing reservoirs, capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method of pipe network analysis.

Unit- 5: Water supply to buildings

6 L

Components of house water supply system, Pipe sizes and recommended velocities and pressures. Pipe fittings and pipe joints. Valves and taps. Hot water supply, Rainwater harvesting, Fire safety and firefighting installation in buildings.

COURSE OUTCOME:

The students will be able to learn about

CO1. Various water demand quantities and basic knowledge about drinking water parameters.

CO2. Treatment of public water supply.

CO3. Design of water treatment plants and storage capacity of reservoir

CO4: Understanding of various components of house water supply system

TEXT BOOKS

1. Garg, S. K., "Water Supply Engineering", Khanna Publishers (RS), New Delhi, 2010.
2. Punmia, B. C., Jain, A. K., "Environmental Engineering-I", Laxmi Publication (P) Ltd., New Delhi, 2005.

REFERENCES

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi.
2. Panchdhari, A. C., "Water Supply and Sanitary Installations", New Age International Publishers, New Delhi, 2nd Edition, 2000.
3. Nazaroff, W. W., Cohen, A. L., "Environmental Engineering Science", Wiley India, 2001.

SR.NO.

EXPERIMENT NAME

- | | |
|---|--|
| 1 | Determination of turbidity, color and conductivity |
| 2 | Determination of pH, alkalinity and acidity |

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

- 3 Determination of hardness and chlorides
- 4 Determination of residual chlorine and chlorine demand
- 5 Determination of dissolved oxygen
- 6 Measurement of sound level with sound level meter
- 7 Determine the quantity of alum required to coagulate a given sample of raw water
- 8 Find out suspended solids, dissolved solids, total solids

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE205	Subject Title	BUILDING MATERIALS AND CONSTRUCTION						
LTP	2 0 0	Credit	2	Subject Category	DC	Year	2 nd	Semester	III

OBJECTIVE:

The objectives of this course is to learn to know about the supporting structures and building amenities.

Unit 1: Introduction to Building Materials

6 L

Bricks: Classification, ingredients, different tests and its applications; Timber: It's Varieties, defects, tests, seasoning, applications; Application of Plywood and Veneers; Tests for fine aggregates.

Unit 2: Lime, Mortar and Stones

5 L

Lime: Classification and its application; Stone: Types of building stone, uses, deterioration and preservation, dressing stones and tests; Mortar: Importance, types and its ingredients.

Unit 3 Foundations

4 L

Requirement of good foundation; Bearing Capacity of soil; classifications and various Applications.

Unit-4 Flooring and Roofing, Stairs Doors and Windows

6 L

Requirements of good floors; Selection of flooring materials; Types of roof and different roofing materials; Types of doors and Windows.

Unit- 5:Masonry and Plastering

5 L

Brick masonry (Bonds); Purpose, methods and defects of plastering, damp proofing.

TEXT BOOKS

1. Kumar, S., "Building Construction", Standard Publishers Distributors, New Delhi, 16th Edition, 2006.
2. Rangwala, S. C., "Engineering Materials (Material Science)", Charotar Publishing House Pvt. Limited, 2008.

REFERENCES

1. Rai, M., Jaisingh, M. P., "Advanced Building Materials and Construction" CBRI Publications, Roorkee, 1985.
2. Punmia, B. C., "Building Construction", Lakshmi Publications (P) Ltd., New Delhi, 2005.
3. Rajput, R. K., "Engineering Material", S. Chand Publication, 2008.

COURSE OUTCOME:

At the end of the course, the student can:

- CO1. About the different types of materials used for building construction
- CO2. Understand types of doors and stairs and its uses and masonry, floors, and roofs.
- CO3. Able to decide the types of materials to be used based on the extent of work to be done.
- CO4. Select suitable type of flooring, plastering and also suitable color to the building.
- CO5. Select and design suitable type of framework.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	HS201	Subject Title	Aptitude and Soft Skills I						
LTP	2 0 0	Credit	0	Subject Category	AC	Year	II	Semester	III

Course Outline: This is a module having basics of aptitude coupled with Soft Skills to help students set the tone for aptitude training to create readiness for campus placement and various competitive exams for Government & non-corporate set-ups. The various tools used in the classes will help them rediscover & reinvent themselves.

Course Objective:

1. Prepare students for becoming confident and corporate-culture fit
2. Get them equipped with the aptitude tools to handle workplace stressors and manage time properly
3. Help them improve their interpersonal skills

Course Pre/Co- requisite (if any): Basic understanding of elementary Mathematics and Logical reasoning and basic understanding of Soft Skills.

Detailed Syllabus

UNIT 1: QUANTITATIVE APTITUDE

05 hours

Simplification: Duplex method for finding square; Vedic mathematics tricks for multiplication of 2, 3, 4 digit numbers; BODMAS application, Finding square roots and cube roots; Introduction to Surds and Indices. Ages Problems based on ages solving with algebraic equations; Concept of hence time and past time. Averages: Basic Concepts; Weighted Average; Basic understanding of mean, median and mode; Application of average on ages, speed time distance and series.

UNIT 2: VERBAL APTITUDE

05 hours

Sentences- Types of sentences, Parts of Speech- application based approach. Vocabulary: Understanding word structure, common roots, prefixes, suffixes, Mnemonic method. Speed Reading: Easy to medium passages-techniques and practical applications, Idioms and phrases. Activities- Words from Dictionary, Newspaper and other sources (theme based).

UNIT 3: LOGICAL REASONING

06 hours

Clock and Calendar, Cubes – Structure of cube, cutting rules, cutting the painted cube into identical cubelets and Dice reasoning – rule detection, pattern completion, image analysis. Missing Number, Mathematical operation, Inequality, Number puzzles.

UNIT 4: SELF-ANALYSIS & INTERPERSONAL SKILLS

05 hours

MBTI and other personality tests, strategies to develop interpersonal skills. **Suggested Activities & Games:** (i) I Am (ii) Flip (iii) A Letter to Yourself, (iv) Card Pieces, (v) Blindfold Game, (vi) Crazy Comic.

UNIT 5: PRESENTATION SKILLS

05 hours

Principles of Effective Presentations, Do's and Don'ts of Formal Presentations, How to prepare for a formal presentation, Presentation Exercises a) Welcome speech, c) Farewell Speech, d) Vote of thanks etc. **Suggested Activities & Games:** (i) Stand Up for Fillers, (ii) Mimes, (iii) Short Speech Challenge.

Learning Outcome

- 1: Get to know more about their personality and gain people skills.
- 2: Be able to deliver presentations more confidently.
- 3: Will have a firm base ready for the upcoming years for the aptitude part.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Text book [TB]:

1. Quantitative Aptitude :How to prepare for Quantitative Aptitude, Arun Sharma, McGraw Hill, 8th edition, 2018.
2. Logical Reasoning : A Modern Approach to Logical Reasoning-R.S. Aggarwal, S Chand Publishing; 2nd Colour edition-2018.
3. Verbal Aptitude : English is Easy- Chetanand Singh, BSC Publication-2018.
4. Soft Skills- The Power of Now- Eckhart Tolle, Yogi Impressions Books Pvt. Ltd.-2010.

Reference books [RB]:

1. Quantitative Aptitude:Quantitative Aptitude for Competitive Examinations- R.S. Agarwal S. Chand Publications-2018.
Quantitative Aptitude: Quantitative Aptitude- Saurabh Rawat and Anushree Sah Rawat Savera Publishing House, 1st edition-2016.
2. Logical Reasoning: Logical Reasoning and Data Interpretation for the CAT - Nishit K Sinha; Pearson India; 5th edition-2016.
Logical Reasoning: Wiley's Verbal Ability and Reasoning - P A ANAND,Wiley -2016.
3. Verbal Aptitude: Fun with grammar- Suzanne W. Woodward Pearson Education ESL-1996.
4. Soft Skills- The Greatness Guide – Robin Sharma, Jaico Publishing House- 2006.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Humanities Electives I

Subject Code	HS241	Subject Title	Education and Social Change						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	II	Semester	IV

Course Objective

- To define the various types of education policies
- To understand the role in striving for social change.
- To overview on education and its implications on social changes to the students.

Unit 1

6 Hrs

General introduction to the place of learning in society. Learning, education and training.

Changing meanings of education across time and society. A brief historical perspective on education in India.

Unit 2

6 Hrs

Social-political arithmetic as a spurious way of understanding education and social change.

Structural functionalist perspectives and structural-conflict perspectives on education

Unit 3

7 Hrs

Class, conflict, legitimation processes, reproduction of society. Anarchist perspectives. “New” Sociology of Education. Symbolic interactionist perspectives on education. Resistances to schooling. Critical theory and education.

Unit 4

7 Hrs

Neo-Weberian perspectives on education. Status politics and education. Caste, class, gender and education in India. Indian thinkers on education. Current debates on the place of education in India.

LEARNING OUTCOME:

- The students will understand how the education system assesses the importance of education in society.
- The students will be able to take a significant action in area of education to maintain social change
- The student will be able to participate in the changes required in society.
- Education will be used as a tool to implement adequate changes in society.

TEXT BOOKS

1. Desai, A.R. (2005), *Social Background of Indian Nationalism*, Popular Prakashan.
2. Giddens, A (2009), *Sociology*, Polity, 6th ed.

REFERENCE BOOKS

- Guha, Ramachandra (2007), *India after Gandhi*, Pan Macmillan.
- Sharma R.S. (1965), *Indian Feudalism*, Macmillan.
- Deshpande, Satish (2002), *Contemporary India: A Sociological View*, Viking.
- Gadgil, Madhav & Ramachandra Guha(1993), *This Fissured Land: An Ecological History of India*, OU Press.
- Haralambos M, RM Heald, M Holborn (2000), *Sociology*, Collins.
- Mohanty, M (ed.) (2004), *Class, Caste & Gender- Volume 5*, Sage.
- Dhanagare, D.N., *Themes and Perspectives in Indian Sociology*, Rawat

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Humanities Electives I

Subject Code	HS242	Subject Title	Introduction to Psychology						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	II	Semester	IV

Course Objective

- To understand the basic psychological processes and their applications in everyday life.

Unit 1 Introduction

5Hrs.

Psychology as a science, perspective, origin and development of Psychology, Psychology in India, Methods: experimental and case study.

Unit 2 Cognitive Processes-Perception

7Hrs.

Nature of perception, laws of perceptual organization, learning, conditioning observational learning, memory processing, information processing model, techniques for improving memory

Unit 3 Motivation and Emotion

7Hrs.

Motives: Biogenic and Sociogenic; Emotion: Nature of Emotions, key Emotion

Unit 4 Personality and Intelligence-Personality

7Hrs.

Nature and Theories; Intelligence: Nature and Theories

Course Outcome:

- The students will develop an understanding of the various psychological processes to maintain their daily activities
- The students will understand themselves better.
- The students will be better equipped for life.
- The Students will be able to demonstrate critical and creative thinking and scientific approach to understand human behaviour.

Text Books:

- Baron, R.A. and Misra, G., Psychology (Indian Subcontinent Edition). Person Education Ltd. (2014)
- Chndha, N.K. & Seth, S., The Psychological Realm: An Introduction. Pinnacle Learning, New Delhi. (2014)

REFERENCE BOOKS:

- Ciccarelli, S.K. & Meyer, G.E., Psychology (South Asian Edition). New Delhi: Tata Mc Graw Hill. (2008)
- Glassman, W.F., Approaches to Psychology (3rd Ed.) Buckingham: Open University Press. (2000)
- Passer, M.W., Smith, R.E., Holt, N. and Bremmer, A., Psychology: The Science of Mind and Behaviour, McGraw-Hill Education, UK. (2008)

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Applicable for Batch: 2019-23

Humanities Electives I

Subject Code	HS243	Subject Title	Science, Technology & Society						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	II	Semester	IV

Course Objective

To increase the basic understanding of students towards science and technology, and basic implications of science & technology on social development.

Unit 1

5Hrs.

Introduction of society, Sociological imagination, the two revolutions and their socio-economic technological and scientific implications; Social significance of science and technology, ideas beyond technology.

Unit 2

5Hrs.

Perspectives on relations between science and technology; Sociological perspective on scientific knowledge: Karl Marx, Emile Durkheim and Karl Mannheim's Sociology of knowledge; Merton's approach to science and technology.

Unit 3

7Hrs.

Ethos of science, Matthew effect in science, Thomas theorem and Mathew effect; Thomas Kunn's notions paradigm and paradigm-based science, Scientific community and growth of scientific knowledge.

Unit 4

9Hrs.

Science in India: science and technology policies in India, Scientific communities and their linkages, national and international Science, Ethics in science & engineering, environment and science and technology

COURSE OUTCOME:

- Enable students to examine the role of science and technology in social and economic development.
- The students will understand perspectives on relations between science and technology.
- The student will be able to understand the scientific temper & its social significance.
- The student will be able to understand and implement technological policies for the betterment of society.

TEXT BOOKS

1. Federic A. Lyman: Opening Engineering Students Mind to Idea to Ideas Beyond Technology. IEEE Technology and Society Magazine, Fall, pp.16-23. (2002)
2. John Theodore Rivers: Technology and the use of Nature. Technology in Society, 25(3), August, pp.403-416 (2003).

REFERENCE BOOKS

- Ronald R. Kline: Using History & Sociology to Tech Engineering Ethics. IEEE Technology and Society Magazine, Winter, pp.13-20 (2002).
- V.V. Krishna: A portrait of the scientific community in India: Historical Growth and Contemporary Problems, Gaillard et al. (eds). Scientific Communities in the Developing World, Sage (1997)

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Humanities Electives I

Subject Code	HS245	Subject Title	Ethics & Self Awareness						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	II	Semester	IV

Course Objective

- To introduce the concepts pertaining to ethical and moral reasoning and action
- To develop self – awareness

Unit 1 Introduction

4Hrs.

Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, Social.

Unit 2 Psycho-social theories of moral development

4Hrs.

View of Kohlberg, Morality and Ideology, Culture and Morality, Morality in everyday context

Unit 3

8Hrs.

Ethical Concerns: Work Ethics and Work Values, Business Ethics, Human values in organizations, Self-Awareness: Self Concept: Johari Window, Self and Culture, Self-Knowledge, Self-Esteem

Unit 4

11Hrs.

Perceived Self-control, Self-serving bias, Self-presentation, Self-growth: Transactional Analysis and Life Scripts. Self-Development: Character strengths and virtues, Emotional intelligence, Social intelligence, Positive cognitive states and processes (Self-efficacy, Empathy, Gratitude, Compassion, and Forgiveness).

COURSE OUTCOME

- Students will develop an understanding of the ethical values and their application in daily activities
- Students will learn business ethics and work ethically in every sphere.
- Students will understand themselves better and develop healthy interpersonal relationships.
- Students will be able to develop themselves into wholesome personalities.

TEXT BOOKS

1. Leary M.R., “The Curse of Self: Self-awareness, Egotism and the Quality of Human Life”, Oxford University Press. 2004
2. Louis P. P., “The Moral Life: An Introductory Reader in Ethics and Literature”, Oxford University Press. 2007

REFERENCE BOOKS

- Corey, G., Schneider Corey, M., & Callanan, P., “Issues and Ethics in the Helping Professions”, Brooks/Cole. 2011
- Snyder, C.R., Lopez, Shane, J., & Pedrotti, J.T., “Positive Psychology” Sage, 2nd edition. 2011

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE206	Subject Title	Structural Analysis						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	2 nd	Semester	IV

Course Objective:

The course is designed to make students aware about the basic concepts of structural analysis and different design principles used there in.

Course Pre/Co- requisite (if any): NA

Detailed Syllabus

Unit 1: Introduction and Analysis of Plane Trusses 8 L

Structural forms, Conditions of equilibrium, Degree of freedom, Linear and Nonlinear analysis, Static and Kinematic indeterminacies of structural systems, Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints and method of sections.

Unit 2: Deflection of Beams 8 L

Deflection of determinate beams by Moment area and Conjugate beam methods, Strain energy due to axial force, Principle of virtual work and Castigliano's theorems, Maxwell's Reciprocal Theorem, Unit load and its application to deflection of determinate beams and trusses

Unit 3: Arches and Cable Structures 8 L

Three hinged parabolic arches with supports at same and different levels, Determination of normal thrust, radial shear and bending moment, Analysis of cables under point loads and UDL, Length of cables for supports at same and at different levels.

Unit-4: Influence Lines and Moving loads 10 L

Concept of influence lines, ILD for reactions, SF and BM for determinate beams, Muller Breslau Principle, ILD for axial forces in determinate trusses, BM, SF and axial forces in determinate systems using ILD, Maximum BM and SF in determinate beams using rolling loads concepts.

Unit- 5: Analysis of Indeterminate Structures 5 L

Slope Deflection method and Moment distribution method

Learning Outcome

At the end of the course, the student can:

CO1. Analyze the framed structures.

CO2. Find out forces in different members of a truss.

CO3. Analyze the beams with moving loads and drawing influence lines.

CO4. Analyze the various components of Indeterminate Structures

TEXT BOOKS

1. Jain, A. K., "Elementary Structural Analysis", Nem Chand Publishers, Roorkee, 1990.
2. Ramamrutham, S., Narayan, R., "Theory of Structure", Dhanpat Rai & Co. Ltd.

REFERENCES

1. Norris, C. H., Wilbur, J. B., "Elementary Structural Analysis", International Student Edition, Literary Licensing, LLC, 2012.
2. Reddy, C. S., "Basic Structural Analysis", Tata McGraw Hill, New Delhi, 2011.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE207	Subject Title	Concrete Technology						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2 nd	Semester	IV

Course Objective:

The objectives of this course are to learn the design concrete mixes for various mix proportions using different types of blending materials such as silica fume, fly ash and blast furnace slag.

Course Pre/Co- requisite (if any): NA

Detailed Syllabus

Unit 1: Concrete Ingredients and Microstructure

9 L

Cement – Chemical composition, hydration of cement, types of cement, manufacture of OPC with flow charts. Tests on cement – field testing, fineness, normal consistency, setting time, soundness, and compressive strength (detailed procedures covered in laboratory). Quality of mixing water. Structure of aggregate phase, structure of hydrated cement paste, structure - property relationship in hydrated cement paste, transition zone in concrete, influence of transition zone on properties of concrete.

Unit 2: Fresh Concrete

7 L

Workability – definition, factors affecting workability, measurement of workability by slump, compaction factor, Vee-Bee, flow tests. Segregation and bleeding, process of manufacture of concrete – batching. Mixing, transporting, placing, compaction, curing of concrete. Chemical admixtures – plasticizers, accelerator, retarders and air entraining agents. Mineral admixtures – fly ash, blast furnace slag, meta kaolin, Silica fume, rice husk ash.

Unit 3 Hardened Concrete

10 L

Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, effect of aggregate properties, compressive strength, tensile strength, bond strength, modulus of rupture, modulus of elasticity, Poisson's ratio, relationship between these parameters. Accelerated curing, aggregate- cement bond strength. Shrinkage – plastic shrinkage and drying shrinkage, factors affecting shrinkage. Creep – measurement of creep, factors affecting creep, effect of creep. Durability – definition, significance, permeability, sulphate attack, chloride attack, carbonation, freezing and thawing. Factors contributing to cracks in concrete – plastic shrinkage, settlement cracks, construction joints. Thermal expansion, transition zone, structural design deficiencies. Tests on hardened concrete – compressive strength, split tensile strength, flexural strength, non-destructive testing of concrete.

Unit-4 Concrete Mix design

5 L

Concept of mix design, variables in proportioning, exposure conditions, procedure of mix design as per IS 10262-1982, numerical examples of mix design.

Unit- 5: Special Concretes

8 L

Constituents, Properties and applications of lightweight concrete, high performance concrete (HSC, SCC), high density concrete, fibre reinforced concrete, Ferro-cement.

Learning Outcome

At the end of the course, the student can:

- CO1. Study the microstructure of basic constituents of concrete.
- CO2. Study the behavior of fresh concrete and hardened concrete.
- CO3. Design different types of concrete mixes.
- CO3. Design different types of special concretes.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

TEXT BOOKS

1. Shetty, M. S., "Concrete Technology", S. Chand & Co. Ltd, New Delhi, 6th Edition, 2005.
2. Mehta, P. K, Monteiro, P. J. M., "Concrete: Microstructure, Properties, and Materials", McGraw Hill Professional, 2013.
3. Gambhir, M. L., "Concrete Technology", Tata McGraw Hill, New Delhi, 5th Edition, 2013.
4. Neville, A. M., Brooks, J. J., "Concrete Technology", Prentice Hall, 2nd Edition, 2010.

REFERENCES

1. Neville, A. M., "Properties of concrete", ELBS Publications, London.
2. IS: 10262: "Recommended Guidelines for Concrete Mix design", BIS Publication.

SR.NO.	EXPERIMENT NAME
1	Normal consistency of cement.
2	Initial and final setting time of cement.
3	Compressive strength of cement.
4	Soundness of cement.
5	Tensile strength of cement
6	Bulking of sand
7	Water absorption of bricks.
8	Compressive strength of bricks.
9	Workability test: Slump Test and Compaction Factor Test
10	Flow Test
11	Compressive Strength Test of Hardened Concrete.
12	Flexural Strength Test of Hardened Concrete.
13	Split Tensile Strength Test of Hardened Concrete.
14	Non Destructive Testing of Concrete
15	Concrete mixed design as per Indian Standard recommendation guidelines.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE208	Subject Title	Engineering Geology						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2 nd	Semester	IV

Course Objective:

The objectives of this course are to apply geological concepts and approaches on rock engineering projects and also to use the geologic literature to establish the geotechnical framework.

Course Pre/Co- requisite (if any): NA

Detailed Syllabus

Unit 1: Physical Geology

8 L

Geology and its importance in civil engineering projects; internal structure of the earth and its composition; Epigene and Hypogene geological agents; Weathering of rocks, Kinds of weathering; Formation of soil and its classification, Soil profile, Soil Texture; Geological hazards such as landslides, volcanoes and earthquakes- causes, effects and remedial measures; Concept of plate tectonics and seafloor spreading.

Unit 2: Applied Mineralogy

6 L

Definition of mineral, Physical and chemical properties in minerals, Classification of minerals based on chemistry such as rock forming Minerals, Economic ore minerals and industrial minerals. Study of Common Rock forming minerals: Silicate Structure, Quartz and its varieties, Feldspars group, Pyroxene Group and Olivine Group

Unit 3 Petrology

6 L

Igneous rocks: Mode of occurrence, Classification, Texture and Structure. Sedimentary rock: Mode of occurrence, textures and structures. Metamorphic rocks- Metamorphism, Agents of metamorphism, Types of metamorphism, Textures and Structure

Unit-4 Structural Geology

10 L

Dip and Strike; Compass clinometer; Description of folds, Faults, Joints and Unconformities with their Types; Recognition of folds and faults in the field and its consideration in Civil Engineering projects.

Unit- 5: Engineering and Hydrogeology

9 L

Geological site investigation, surface and subsurface explorations by geological and geo-Physical investigations, Selection of Geological site for construction of Dams and Reservoirs, Tunnels, Bridge Sites, and Highways. Hydrogeology: Hydrological cycle, water bearing properties of rocks and soils. Aquifers and its types.

Learning Outcome

At the end of the course, the student can :

- CO1. Able to interpret the geological data and information required for the safe development of civil works.
- CO2. Apply basic Engineering concepts to assessment and mitigation of geologic hazards such earthquakes, landslides, flooding;
- CO3. Focus on the core activities of engineering geologists, site characterization for civil work projects
- CO4. Distinguish the characteristic of most important geological formations and problems that may arise in various public works.
- CO5. Understand issues concerning the geological basement and structure of a region.

TEXT BOOKS

1. Singh, P., "Engineering Geology", S. K. Kataria & Sons, New Delhi, 2009.
2. B.S.Satyanarayana Swamy, Engineering Geology Laboratory Manual, Dhanpat Rai Sons, New Delhi.

REFERENCES

1. Reddy D. V., "Engineering Geology", Vikas Publishing House Pvt. Ltd, Noida.
2. Varghese, P. C., "Engineering geology for Civil Engineers", PHI Learning Pvt. Ltd., 2012.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

SR.NO.	EXPERIMENT NAME
1	Identification of minerals in hand specimen
2	Identification of igneous rocks in hand specimen
3	Identification of sedimentary rocks in hand specimen
4	Identification of metamorphic rocks in hand specimen
5	Study and Interpretation of Contour
6	Topography and Geological Maps
7	Solving Dip and Strike Problems

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE209	Subject Title	Transportation Engineering -I						
LTP	3 1 2	Credit	5	Subject Category	DC	Year	2 nd	Semester	IV

Course Objective:

This course provides in-depth exposure to highway development and planning, construction materials and their testing, highway geometric design, types of highway, highway design and their construction methods along with guidelines for their maintenance.

Course Pre/Co- requisite (if any) : NA

Detailed Syllabus

Unit 1: Highway Development and Planning:

6 L

Importance of transportation, Different modes of transportation and their characteristics, Classification of roads, Different road patterns, Jaykar committee recommendations and implementation, Twenty year road development plans in India, Introduction to recent developments in road network in India, Highway planning and alignment

Unit 2: Highway Materials and Properties

8 L

Classification of subgrade soil, CBR and plate load tests on soil, Properties and requirements of road aggregates and bitumen, Cutbacks and bituminous emulsions, Introduction to new materials in pavements

Unit 3 Geometric Design

8 L

Highway Cross sectional elements, Sight distances, Super elevation, Camber, Extra widening on curves, Design of horizontal and vertical alignments

Unit-4 Pavement Design and Maintenance:

11 L

Various factors of pavement design, Concept of ESWL, Design of flexible pavement by IRC method, Stresses in rigid pavement, Design of rigid pavement thickness by IRC method. Highway Construction ,Various types of Pavement failures, Design of Overlay thickness by Benkelman Beam Method

Unit- 5: Traffic Engineering

6 L

Introduction to Traffic Engineering, Traffic Characteristics, Road user and vehicular characteristics, Traffic Studies, Traffic operations, Traffic control devices

Learning Outcome

After learning the course the students will be able to:

CO1. Plan effectively the road system.

CO2. Judge the suitability of the road materials

CO3. Design, construct and maintain effectively the roads. .

CO4. Solve the traffic problems by properly designing the geometric elements of the road ensuring traffic safety.

TEXT BOOKS

1. Khanna, S. K., Justo, C. E. J., Veeraraghavan, A., „Highway Engineering”, Nem Chand and Bros., Roorkee, 9th Edition, 2011.
2. Kadiyali, L. R., Lal, N. B., „Principles and Practices of Highway Engineering”, Khanna Publishers, New Delhi, 4th Edition, 2005.
3. Kadiyali, L. R., “Traffic Engineering and Transportation Planning”, Khanna Publishers, New Delhi, 6th Edition, 1997.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

REFERENCES

1. Sharma, S. K., Sharma, R. C., “Principles and Design of Highway Engineering”, S. Chand & Company. 2012
2. Khanna, S. K., Justo, C. E. J., “Highway Material Testing Laboratory Manual”, Nem Chand and Bros., Roorkee.

SR.NO.	EXPERIMENT NAME
1	Specific gravity test of bitumen
2	Ductility test of bitumen
3	Flash point and fire point test of bitumen
4	Penetration test of bitumen
5	Softening test of bitumen
6	Viscosity test of bitumen
7	Bitumen Content
8	Stripping Test on aggregate
9	Abrasion test of aggregate
10	Shape test (flakiness, elongation and angularity number) of aggregate
11	Impact value test of aggregate
12	Specific gravity test of aggregate
13	Crushing strength of aggregate
14	Marshall Test for stability and flow value
15	Benkelman Beam Test (Demonstration)

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE211	Subject Title	Soil Mechanics						
LTP	3 1 2	Credit	5	Subject Category	DC	Year	2 nd	Semester	IV

Course Objective:

The objectives of this course are to understand the basic properties of soil, to determine the strength of soil so that various properties can be known before design and to undertake a variety of laboratory tests on soils.

Course Pre/Co- requisite (if any) : NA

Detailed Syllabus

Unit 1: Introduction Properties of Soils:

8 L

Definition of void ratio, Porosity, percentage air voids, Air Content, Degree of saturation, moisture content, specific Gravity, Bulk density. Dry density, saturated density, Submerged density and their inter relationships. Index property of soil –particle size Distribution, Relative Density, consistency limits and indices, in situ density, laboratory method of determination of index properties of soil: moisture content, specific gravity, particle size distribution (Sieve analysis and hydrometer analysis only), in situ density by Core cutter & sand replacement methods, relative density, liquid limit- Casagrande and Cone penetration method, Plastic limit and Shrinkage limit determination.

Unit 2: Classification of soils and Clay mineralogy and Soil Structure:

6 L

Purpose of soil classification, basis of soil classification, particle size classification-MIT classification and IS classification, plasticity chart and its importance, field identification of soil. single grained, honey combed, flocculent and dispersed structure, Electric diffuse a double layer, Adsorb water, Base Exchange capacity, Isomorphous substitution. Common Clay mineral in soil and their structure- Kaolonite, Illite and montmorillonite. Thixotropy of clay, Soil water system, Effective stress concept total pressure and effective stress, quick sand phenomenon, capillary phenomenon.

Unit 3: Flow of Water Through Soils and Compaction of Soils:

8 L

Darcy's law- assumptions and validity, coefficient of permeability and its determination (laboratory and field) factor affecting permeability, permeability of stratified soil, seepage velocity, superficial velocity and coefficient of percolation.

Principle of compaction, standard and modified proctor's tests, factor affecting compaction, effect of compaction on soil properties, field compaction control, proctor needle, compacting equipments.

Unit-4: Consolidation of Soils

8 L

Definition, Mass spring Analogy, Terzaghi's one dimensional consolidation theory assumption and limitation, normally consolidated, under consolidated and over consolidated soils pre consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil, laboratory one dimensional consolidation test, Determination of consolidation characteristic Proportioning of soil compression index and coefficient of consolidation, determination of coefficient of consolidation by square root of time fitting method, logarithmic time fitting method.

Unit- 5: Shear Strength of Soils

9 L

Concept of shear strength, Mohr-coulomb theory, conventional and modified failure envelope, total and effective shear strength parameters, concept of pore Pressure, factor affecting shear strength of soils, sensitivity, Measurement of shear strength- direct shear test, Unconfined compression test, Triaxial compression test and Vane shear test, shear tests and under different drainage condition.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Learning Outcome

At the end of the course, the student can:

- CO1. Develop and understand the physical relationships between physical characteristics and mechanical properties of soil.
- CO2. Understand and experience experimental measurement of physical and mechanical soil properties commonly used in engineering practice.
- CO3. Learn compaction and consolidation of soil
- CO4. Learn analysis and measurement of shear strength of soil

TEXT BOOKS

- 1. Punmia, B. C., Jain, A. K., Jain, A. K., "Soil Mechanics and Foundations", Laxmi publication Co. New Delhi, 17th edition, 2017.
- 2. Ranjan, G., Rao, A. S. R., "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi, 3rd Edition, 2016.

REFERENCES

- 1. Das, B. M., Sobhan, K., "Principles of Geotechnical Engineering" 8th Edition. Thomson business information India (P) Ltd., India
- 2. Singh, A., Chowdhary, R., "Soil Engineering in Theory and Practice", CBS publishers and distributors Ltd., New Delhi.
- 3. Murthy, V. N. S., "Soil Mechanics and Foundation engineering", 4th Edition, UBS publishers and Distributors, New Delhi.
- 4. Sitaram, T. G., Ramamuthy, T. N., "Geotechnical engineering", S. Chand & Co New Delhi.
- 5. Off., H. M. S., "Soil mechanics for road engineers, Road Research Laboratory", U. K., Vol. I, 1952.

SR.NO.	EXPERIMENT NAME
1	Sieve Analysis
2	Hydrometer Analysis
3	Liquid, Plastic & Shrinkage Limit Test
4	Proctor Compaction Test
5	Triaxial Compression Test
6	Specific Gravity Determination of Coarse and Fine Grained Soils
7	In Situ Density-Core Cutter & Sand Replacement Test
8	Permeability Test
9	Direct Shear Test
10	Static Cone Penetration Test
11	Standard/Dynamic Cone Penetration Test

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	HS204	Subject Title	Aptitude and Soft Skills II						
LTP	2 0 0	Credit	0	Subject Category	AC	Year	II	Semester	IV

Course Outline: This module is focused on providing students more hands-on practice on aptitude problems and prepare a stronger fundamental base for Aptitude and Soft Skills III and IV. Employability skills will help students improve their employability.

Course Objective:

1. Prepare a ground for the students to be ready in Quantitative, Logical Aptitude and Verbal Aptitude
2. Prepare them for becoming confident and corporate-culture fit as present-day workplace requires professionals who are not only well qualified and competent but also possess Soft Skills like interpersonal skills and good presentation skills

Course Pre/Co-requisite (if any): Basic understanding of simplification and calculation tricks, non-verbal pattern completion LR, covered in Aptitude and Soft Skills I.

Detailed Syllabus

UNIT 1: QUANTITATIVE APTITUDE

06 hours

Basic algebraic equations (linear equations in one variable), polynomials and Algebraic Inequalities; logarithm. Quadratic Equations (concept of determinant, real, non-real, rational and conjugate roots); Geometry and Mensuration; Heights and Distances.

UNIT 2: VERBAL APTITUDE

04 hours

Figures of speech; Determiners.
Creative Writing: Essay, Report Writing, Article, Letters, E-mail, difference between formal and informal tone, appropriate use of transition words, creating a signature, understanding different situations and the responses they require (situation- based writing), Proper use of connectors.

UNIT 3: LOGICAL REASONING

05 hours

Input Output – Sequential output tracing of logical operations applied on machine input, Ranking and Order- Test - Ordering of measurable attributes like height / weight / performances, etc.
Eligibility test, Logical sequences and series, Completion of incomplete pattern, Odd figures or Odd man out, Analogies, Coding Decoding basics.

UNIT 4: LEADERSHIP & TEAM BUILDING SKILLS

05 hours

Importance, How to develop Leadership Skills? Best Leadership & Team Building Examples.
Suggested Activities & Exercises: (i) Leadership Pizza, (ii) Minefield, (iii) Leaders You Admire.

UNIT 5: EMPLOYABILITY SKILLS & CV WRITING

06 hours

What Skills Do Employers Expect From Graduates? CV vs. Resume, CV writing Do's & Don'ts, Tips with Best Examples/ Samples, Feedback Sharing & Error Analysis.

Suggested Activities & Exercises: (i) Relevant Videos on 'Employability', (ii) Group Discussions on Newspaper Articles, (iii) Sample correction, (iv) writing exercise.

Course Structure & Syllabus of B.Tech – Civil Engineering Applicable for Batch: 2019-23

Learning Outcome

- 1: Develop Leadership & Team Building Skills.
- 2: Receive hands-on guidance to develop an effective CV.
- 3: The students would be able to understand the basic trends of questions asked in the aptitude part of placements.

Text book [TB]:

1. Quantitative Aptitude: How to prepare for Quantitative Aptitude, Arun Sharma, McGraw Hill, 8th edition-2018.
2. Logical Reasoning: A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Aggarwal, S Chand Publishing; 2nd Colour edition-2018.
3. Verbal Aptitude: English is Easy- Chetanand Singh, BSC Publication-2018

Reference books [RB]:

1. Quantitative Aptitude: Quantitative Aptitude for Competitive Examinations- R.S. Agarwal S. Chand Publications-2018.
Quantitative Aptitude: Quantitative Aptitude- Saurabh Rawat and Anushree Sah Rawat Savera Publishing House, 1st edition-2016.
2. Logical Reasoning: Analytical & Logical Reasoning by Peeyush Bhardwaj-Arihant Publications; 4th edition-2015.
Logical Reasoning: Analytical Reasoning by M.K. Pandey BSC publishing; 3rd edition . -2009.
3. Verbal Aptitude: Oxford Guide to English Grammar- John Eastwood, Oxford University Press-2003.
4. Soft Skills: Talk like Ted – Carmine Gallo, St. Martin's Press.
Soft Skills: No Excuses – Dr Wayne Dyer, Hay House Inc.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE301	Subject Title	Waste Water Engineering						
LTP	2 0 0	Credit	2	Subject Category	DC	Year	3 rd	Semester	V

Course Objective:

The course is designed to have the knowledge about different types of sewerages and sewage treatment procedures

Course Pre/Co- requisite (if any) : NA

Detailed Syllabus

Unit 1: Introduction

4 L

Basic Definitions, Types of sewerage systems, Quantity of sewage, Dry weather flow and factors affecting dry weather flow

Unit 2: Design of Sewers

6 L

Hydraulic formulae for velocity, Effects of flow variation on velocity, Laying and jointing of sewers, Testing of sewers, Ventilation and cleaning of sewers, Sewer appurtenances

Unit 3: Wastewater Characterization

5 L

Analysis of sewage with emphasis on BOD and COD, Concept of aerobic and anaerobic activity, Sampling, Effluent standards.

Unit-4: Treatment of Sewage

5 L

Flow diagram of municipal sewage treatment plant, Primary treatment, Screening, Grit chamber, Skimming tank, Primary sedimentation tank.

Unit- 5: Secondary Treatment

6 L

Theory and operation of trickling filter and types of trickling filters. Activated sludge process and its modifications. Sludge drying beds, Other methods of sludge disposal on site treatment method.

Learning Outcome

At the end of the course, students must be in a position to:

- CO1. To apply sewage treatment knowledge in various rural and urban city planning.
- CO2. Estimate waste water characteristics.
- CO3. Design of sewerage tanks and pipes for sewers after determining the capacity.
- CO4. Design of sewerage treatment plants based on characteristics.

TEXT BOOKS

1. Garg, S. K., "Environmental Engineering: Sewage Disposal and Air Pollution Engineering", Khanna Publishers, New Delhi, 26th Edition (Paperback), Vol. II, 2010.
2. Punamia, B. C., Jain, A. K., "Waste Water Engineering", Firewall Media, New Delhi, 1998.

REFERENCES

1. Manual on Sewage and Sewerage Treatment, CPHEEO, Ministry of Urban Development, New Delhi.
2. Eddy & Metcalf, 'Waste water Engineering', Tata McGraw Hill

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE302	Subject Title	Transportation Engineering II						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	3 rd	Semester	V

Course Objective:

This course covers complete knowledge of “Cross-section, Components, and geometric design of railway track as well as development of railway station and yards.” In this course all Airport characteristics, Geometric design and Air traffic control are covered.

Course Pre/Co- requisite (if any) : NA

Detailed Syllabus

Unit 1: Introduction and Components:

12 L

Role of railways in transportation, The Permanent way, Gauges in railway track, Typical cross sections of railway track, Coning of wheels, Track components: Type of rails, Rail Joints and Welding of rails ,Sleepers, Ballast, and Fixtures, Stresses in rails, Tractive resistances.

Unit 2: Geometric Design of Railway Tracks

8 L

Geometric design of tracks- speed calculations, Gradients- ruling, momentum, pusher and minimum gradient, Super elevation, Cant Deficiency, Negative super elevation, Component of turn outs, points and crossings, Track Junctions

Unit 3: Railway Station and Yards:

4 L

Classification of railway Stations, Types of station Yards, Signalling and Control System, Interlocking of Signals and Points. Modern Development of Railways

Unit-4 Airport Characteristics:

6 L

Role of Airways in transportation, Aeroplane Component Parts, Aircraft Characteristics, Airport planning, Site selection, Airport Obstructions

Unit- 5:Geometric Design and Air Traffic Control:

9 L

Wind rose diagram, Basic runway length, and corrected runway length, Geometric runway and Taxiway Design ,Turning radius of taxiway, Exit taxiway- design factors and elements, Airport markings and lightings, Air traffic control, Instrument landing systems

Learning Outcome

This course will help the students in learning of :

- CO1. Working of world’s largest rail network,
- CO2. Designing of rail tracks.
- CO3. Managing safety issues in railways.
- CO4. Airport runway designing.
- CO5. Air traffic control in the busiest route.

TEXT BOOKS

1. Saxena, S. C., Arora, S. P., “A Text Book of Railway Engineering”, DhanpatRai Publications Pvt. Ltd.,New Delhi, 6th Edition, 2001.
2. Khanna, S. K., Arora, M. G., and Jain, S. S., “Airport Planning and Design”, Nem Chand and Bros., Roorkee, 6th Edition, 2008.

REFERENCES

- 1.Horonjeff, R. M., Mckelvey, F. X., Sproule, W. J., and Young, S., “Planning and Design of Airports”, Mc-Graw Hill Publications, New Delhi, 5th Edition, 2010.
2. Chandra, S., and Agrawal, M. M., “Railway Engineering”, Oxford University Press, 2007.
- 3.Saxena S.C, “Airport Engineering, Planning and Design”, CBS Publishers and Distributors , Pvt. Ltd. Reprint Ed. 2015.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE303	Subject Title	Design of Reinforced Concrete Elements						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	3 rd	Semester	V

Course Objective:

The course is designed to make students aware about the various principles of reinforced concrete structures and to design various elements using limit state method.

Course Pre/Co- requisite (if any) : CE202 (Solid Mechanics)

Detailed Syllabus

Unit 1: Introduction to Working Stress Design

5 L

Introduction to working stress method, elastic behavior of rectangular section, under, balanced and over reinforced section. Deflection and cracking in beams and slabs using IS code provisions. Design of singly reinforced beams

Unit 2: Introduction to Limit State Design

8 L

Philosophy and principle of limit state design along with the assumptions, partial safety factors, characteristic load and strength. Introduction to stress block parameters, concept of balanced, under reinforced and over reinforced sections, limit state of collapse in flexure of rectangle and flanged sections with examples. Limit state of collapse in shear and torsional strength of sections with examples

Unit 3: Limit state design of beams

8 L

Design principles and procedures for critical sections for bending moment and shear forces. Flexural and shear design example of singly and doubly reinforced simply supported and cantilever beams using the codal provision. Detailing of longitudinal and shear reinforcement, anchorage of bars, check for development length. Reinforcement requirements, slenderness limits for beams for lateral stability. Flexural and shear design of simply supported T and L beams. Design of rectangular section for torsion.

Unit-4: Limit State Design of Slabs

9 L

Introduction to one way and two way slabs, design of one way cantilever, simply supported and continuous slab and design of two way slabs.

Unit- 5: Limit State Design of Columns and Footings

9 L

General design aspects of compression members. Design of short axially loaded columns with reinforcement detailing. Design of uniaxial and biaxial bending columns using SP- 16 charts and design of slender column. Design and detailing of isolated rectangular footing for axial load and uniaxial moment and design of pedestal.

Learning Outcome

At the end of the course, the student can:

CO1. Understand the principle of RC Structure

CO2. Understand the design of structure with limit state analysis.

CO3. Identify different elements of a R.C.C structure as per IS code provisions

CO4. Understand the reinforcement detailing of various building components

TEXT BOOKS

1. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi
2. Pillai, S. U., Menon, D., "Design of reinforced concrete structures"- Tata McGraw hill publications, 3rd Edition, 2009.
3. Varghese, P. C., "Limit State Design of Reinforced Concrete", PHI Learning Pvt. Ltd., India, 2nd Edition, 2008

Course Structure & Syllabus of B.Tech – Civil Engineering Applicable for Batch: 2019-23

REFERENCES

- 1.Reinforced concrete structures, Vol.1, by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
- 2.Design of concrete structures – Arthus H.Nilson, David Darwin, and Chorles W. Dolar, Tata McGraw-Hill, 3rd Edition, 2005
- 3.Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of India Private Ltd., New Delhi.
- 4.Design of concrete structures by J.N.Bandhyopadhyay PHI Learning Private Limited.
- 5.Design of Reinforced Concrete Structures by I.C.Syal and A.K.Goel, S.Chand & company.
- 6.Sinha, S. N., “Reinforced concrete Design”, Tata McGraw-Hill Education, New Delhi, 2002 .
- 7.Park, R., Paulay, T., “Reinforced Concrete Structures”, John Wiley and Sons, New York, 1975.
- 8.Punmia, B. C., Jain, A. K., Jain, A. K., “Limit State Design of Reinforced Concrete”, Firewall Media, New Delhi, 2007.
- 9.Jain, A. K., “Reinforced Concrete Limit State Design”, Nemchand & Brothers, Roorkee

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE304	Subject Title	Foundation Engineering						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	3 rd	Semester	V

Course Objective:

The objective of this course is to learn application of soil mechanics and other related techniques to design and analyze various types of foundation by learning methods of soil exploration; bearing capacity and settlements determination for shallow and deep foundation and provision of earth retaining structures.

Course Pre/Co- requisite (if any) : CE211 (Soil Mechanics)

Detailed Syllabus

Unit 1: Introduction & Soil Exploration

6 L

Brief review of soil mechanics principles used in foundation engineering, Methods of soil exploration, Boring, Sampling, Penetration tests, Correlations between penetration resistance and soil design parameters, geophysical and advance soil exploration methods.

Unit 2: Earth Pressures and Slope Stability

8 L

Earth pressure at rest, Active and passive earth pressure, Rankine's and Coulomb's earth pressure theories, Earth pressure due to surcharge, Retaining walls, Stability analysis of retaining walls, Slopes: Mode of failure-Mechanism, Stability analysis of infinite slopes, Swedish slip circle method, Taylor's stability number

Unit 3: Shallow Foundations

12 L

Types of Foundations, Mechanism of load transfer in shallow and deep foundations, Shallow foundations, Terzaghi's bearing capacity theory, Computation of bearing capacity in soil, Effect of various factors, Use of field test data in design of shallow foundations, Stress below the foundations, Settlement of footings and rafts, proportioning of footings and rafts, Sheet piling and bracing of foundation excavation

Unit-4 Deep Foundations

8 L

Types and methods of construction, estimation of pile capacity, Capacity and settlement of group of piles, Proportioning of piles, Methods of construction of well foundation, Tilt and Shift, Remedial measures, Bearing capacity, Settlement and lateral stability of well foundation.

Unit- 5: Reinforced Earth and Geotextiles

5 L

Reinforced Earth, Geotextile: Definition, types, functions. Use of Geotextiles in Earth dams, roads, railways, erosion control and bearing capacity improvement. Storage, handling and placement of Geotextiles

Learning Outcome

At the end of the course, the student can:

- CO1. Learn about types and purposes of different foundation systems and structures.
- CO2. Learn about the systematic methods for designing foundations.
- CO3. Evaluate the feasibility of foundation solutions to different types of soil conditions
- CO4. Learn about applications of geotextiles for reinforced earth and soil stabilization.

TEXT BOOKS

1. Punmia, B. C., Jain, A. K., Jain, A. K., "Soil Mechanics and Foundations", Laxmi publication Co. New Delhi, 17th edition, 2017.
2. Ranjan, G., Rao, A. S. R., "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi, 3rd Edition, 2016.

REFERENCES

1. Bowles, J. E., "Foundation Analysis and Design", McGraw-Hill, New Delhi, International Edition, 2001.
2. Singh, A., Chowdhary, G. R., "Soil engineering in theory and practice", CBS Publishers, New Delhi.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE305	Subject Title	Structural Analysis Lab						
LTP	0 0 2	Credit	1	Subject Category	DC	Year	3 rd	Semester	V

Course Objective:

To learn the basic structural behavior under different loading patterns and variation in geometry

Course Pre/Co- requisite (if any) : CE206 (Structural Analysis)

Detailed Syllabus

List of Experiments

1. Redundant Joint Apparatus
2. Elastically Coupled Beam Structure
3. Deflection of Truss Apparatus
4. Three Hinged Arch Apparatus
5. Beam Model
6. Two Hinged Arch Apparatus
7. Elastic Properties of Deflected Beam Apparatus
8. Column Apparatus
9. Portal Frame Apparatus
10. Curved Member Apparatus

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE341	Subject Title	Advanced Highway Engineering						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	3rd	Semester	V

Course Objective:

The objectives of this course is to introduce the students to latest methods of pavement construction and to enable students to design different types of pavements as per the requirement.

Course Pre/Co- requisite (if any) : CE209 (Transportation Engineering-I)

Detailed Syllabus

Unit 1: Introduction:

3 L

National Road Development Program, Bombay Plan, Lucknow Plan, IRC Vision- 2021 and Rural Road Vision- 225, Comparison and significance, financial analysis of highway projects, Vehicle Operating Cost.

Unit 2: Road Materials:

6 L

Tests on soil (Triaxial), strength of pavement materials, importance and functions of each layer of pavement and subgrade, Alternate forms of aggregates, theory of specifications of fillers, additives, emulsions, cutbacks and modified binder, Bituminous Mix design Methods(Marshall, Hubbard Field and Hveem), Soil Stabilized Roads: Properties of Soil- Aggregate mixtures, Proportioning, types of stabilization, advantages and limitation, Highway drainage- Surface and Sub surface drainage.

Unit 3: Design of Flexible Pavements:

6 L

Design of Flexible Pavements: Design factors, empirical, semi empirical and analytical design method: California bearing ratio, Triaxial, Mcleod and Burmister method, advantages and limitations, IRC method of design (as per IRC 37:2012). Pavement Failures, Overlay design

Unit-4 Design of Rigid Pavements

6 L

Design of Rigid Pavements: Design factors, load and temperature stresses, load transfer devices, design of Dowel bar and Tie bar, Type of Joints, IRC methods of design of SFRC pavements, construction techniques and specifications, quality control tests, continuously reinforced concrete pavements. Pavement Failures, Overlay design.

Unit- 5: Highway Construction:

5 L

Construction of Water bound Macadam road, Bituminous Pavements, Concrete Roads. Reinforced Concrete Roads, Prestressed Concrete Pavements.

Learning Outcome

This course enables the students to:

- CO1. Use various materials for pavement constructions.
- CO2. Apply the principles of pavement design.
- CO3. Various methods of mix design.
- CO4. Various design methodologies of pavement construction

TEXT BOOKS

1. Yodar, E. J., "Principle of Pavement Design", Wiley, 2nd Edition.
2. Statinary Off., H. M., "Bituminous Material in Road Construction", Road Research Laboratory, 1962.
3. Kerbs, R. D., and Walker, R. D., "Highway Materials", McGraw-Hill, 1971.

REFERENCES

1. Khanna, S. K., Justo, C. E. G., "Highway Engineering", Nem Chand and Bros, 2001.
2. Huang, Y.H., "Pavement Analysis and Design" Prentice Hall

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE342	Subject Title	Environmental Risk Assessment and Disaster Management						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	3 rd	Semester	V

Course Objective:

The objectives of this course are to learn basic concepts of Environmental components, Impact assessment, Natural hazards and mitigation strategies.

Course Pre/Co- requisite (if any) : CH201 (Environmental Science)

Detailed Syllabus

Unit 1: Environmental attributes and assessment

6 L

Introduction and Scope utility of the Environmental Impact Assessment process, expanded and narrowed scope of Environmental Impact Assessment, impacts of development activities, planning and management of impact studies. Environmental attributes and environmental indices and indicators, environmental assessment, methods and techniques, matrices, network and checklist methods, prediction techniques for quality of environmental attributes

Unit 2: Environmental Impact and Risk Assessment

7 L

Impact evaluation, assessment of impact on air, water, soil and ground water, noise, biological environment. Assessment of impact on socio-economic environment, evaluation methods, mitigation measures. Health risk assessment, Hazard identification, toxicology and dose response characterization, exposure characterization, risk characterization, uncertainty in estimates. Risk evaluation, risk acceptance, basic principles of health risk management.

Unit 3 Understanding Disasters

7 L

Meaning, nature, characteristics and types of Disasters, Causes and effects, Disaster: A Global View, Disaster Profile of India, The Disaster Management cycle.
Geological and Mountain Area Disasters: Earthquakes, Volcanic eruption, Landslides, Snow Avalanches. Wind and Water Related Natural Disaster: Floods and Flash Floods, Droughts Cyclones, Tsunamis. Man Made Disasters: Understanding Man Made Disasters: Fires and Forest Fires, Nuclear, Biological and Chemical disaster, Road Accidents.

Unit-4 Disaster Risk Reduction and Role of various Organizations

3 L

Disaster Management: Prevention, Preparedness and Mitigation. Roles and responsibilities of different agencies and Government. Technologies for Disaster Management. Disaster Mitigation Strategies.

Unit- 5: Disasters, Environment and Development

3 L

Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Learning Outcome

At the end of the course, the student can:

- CO1. Identify environmental attributes, necessity and components of Impact assessment and its various methods
- CO2. Have the complete knowledge about natural and human induced disasters.
- CO3. Gain the idea about various mitigation measures, remedial actions to minimize the loss of resource and lives.
- CO4. Identify the roles of various Government and non-Government agencies for enforcing Environmental laws and disaster mitigations

Course Structure & Syllabus of B.Tech – Civil Engineering Applicable for Batch: 2019-23

TEXT BOOKS

1. CK Rajan, N Pandharinath – 2009, Earth and Atmospheric Disaster Management: Nature and Man-made, BS publications
2. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
3. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
4. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

REFERENCES

1. Kenneth, W., Werner, F. C., Davis W. T., "Air Pollution: Its Origin and Control", 3rd Edition, Prentice Hall.
2. Mishra, P. C., "Fundamentals of Air and Water Pollution", South Asia Books, 1990.
3. Masters, G., "Introduction to Environmental Engineering and Science", Prentice Hall of India, 2004.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE343	Subject Title	Advanced Surveying						
LTP	2 0 2	Credit	3	Subject Category	DE	Year	3 rd	Semester	V

Course Objective:

The course is designed to make students aware about theory of errors and the advanced methods and techniques of surveying, establishing horizontal & vertical control over the terrain with the degree of accuracy as desired.

Course Pre/Co- requisite (if any) : CE203 (Basic Surveying)

Detailed Syllabus

Unit 1: Theory of Errors

5 L

Types and sources of errors, theory of least squares, method of weights, method of correlates, angle and station adjustment, figure adjustment.

Unit 2: Triangulation

6 L

Necessity of Control Surveying, Principle of Triangulation, Classification of Triangulation Systems, Station Marks, Towers and Signals, Satellite station, Reconnaissance, Inter-visibility of stations, Angular Measurement, Base line measurement and its extension.

Unit 3 Project surveys

5 L

General requirements and specifications for engineering project surveys, reconnaissance, preliminary and locations surveys for highway, earthen bund and canals. Layout of culverts, canals, and buildings-both load bearing wall structure and column structures by centerline method. Modern trends- EDM, electronic Theodolites and Electronic Total Station

Unit-4 Introduction to remote sensing

5 L

Remote sensing: Definition and concepts. Concept of signatures. Multi-spectral concept. Remote sensing systems. Remote sensors and platforms. Data products generation and analysis. Application of remote sensing in agriculture, forestry, land cover/ use mapping, water resources, wet land management, coastal zone management and marine fisheries.

Unit- 5:Global Positioning System

5 L

Global Positioning System- NAVSTAR GPS system. Advantages of GPS. Components of GPS- Space, control and user segments. Principles of position fixing with GPS. Relative and differential positioning. Factors affecting GPS observations, GPS applications.

Learning Outcome

At the end of the course, the student can:

- CO1. Identify and correct errors in field measurements.
- CO2. Apply procedures of triangulation in field survey.
- CO3. Comprehend the use and applications of advanced methods of data collection like remote sensing.
- CO3. Understand the working principles of GPS.

TEXT BOOKS

1. Punmia, B. C., Jain, A. K., Jain, A. K., "Surveying", Laxmi Publications Pvt. Ltd., New Delhi, Vol. I & II, 12th Edition, 2005.
2. Reddi, M. A., "Remote Sensing and Geographical Information Systems", BS Publications, 2001.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

REFERENCES

1. Roy S. K., "Fundamental of surveying", Prentice Hall of India, 2nd Edition, 2010.
2. Chandra, A. M., "Plane Surveying", New age International, 2nd Edition, 2006.
3. Arora, K.R., "Surveying", Standard Book House, Delhi, Vol. II & III, 11th Edition, 2010.
4. McCormac, J. C., Sarasua, W., Davis, W., "Surveying", Wiley India, 6th Edition, 2012.
5. Lillesand, T. M., Kiefer, R.W., Chipman, J. W., "Remote Sensing and Image Interpretation", John Wiley & Sons Limited, Canada, 5th Edition, 2004.
6. Agor, R., "A Text Book of Surveying and Levelling", Khanna Publications, Delhi, 11th Edition, Vol. II & III, 2012.

SR.NO.

EXPERIMENT NAME

1. Marking of building by centre line method for load bearing wall residential building.
2. Marking of building by centre line method for columns for small commercial complex.
3. Exposure to the use of Total Station.
4. Measurement and data logging of distances, horizontal angles and vertical angles using Total Station.
5. Measurement of Areas using total station
6. Collection of field data using GPS.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE344	Subject Title	Building Planning & Drawing						
LTP	1 0 4	Credit	3	Subject Category	DE	Year	3 rd	Semester	V

Course Objective:

The objective of this course is to learn drawing of each element of construction on paper before beginning the actual construction in field and To gain knowledge about construction of structures in steps.

Course Pre/Co- requisite (if any) : ME103 (Engineering Graphics)

Detailed Syllabus

Unit 1: Introduction

4 L

Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, coordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.

Unit 2: SYMBOLS AND SIGN CONVENTIONS

3 L

Building Bye-Laws: Objectives, importance of bye-laws, Principles underlying building bye laws. Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards.

Unit 3: MASONRY BONDS

2 L

English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall, Doors & windows

Unit-4: BUILDING DRAWING

2 L

Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings, Foundation plan

Unit- 5: PICTORIAL VIEW

2 L

Principles of isometrics and perspective drawing. Perspective view of building.

SR.NO.

EXPERIMENT NAME

- 1 Buildings with load bearing walls including details of doors and windows.
- 2 Taking standard drawings of a typical two storeyed building including all MEP, joinery, rebars, finishing and other details and writing out a description of the Facility in about 500 -700 words.
- 3 RCC framed structures
- 4 Reinforcement drawings for typical slabs, beams, columns and spread footings.
- 5 Industrial buildings - North light roof structures - Trusses
- 6 Perspective view of one and two storey buildings.

Learning Outcome

At the end of the course, the student can:

CO1. Learn details of different construction elements and will enable them to read a construction drawing which is a requisite for an economic and speedy construction

CO2. Learn various projection techniques used in Engineering Drawings

CO3. Learn the standards of various building components as per national building code

CO4. Learn the building by laws in Indian context

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

TEXT BOOKS

1. Subhash C Sharma & Gurucharan Singh (2005), “Civil Engineering Drawing”, Standard Publishers.
2. Ajeet Singh (2002), “Working with AUTOCAD 2000 with updates on AUTOCAD 2001”, Tata- Mc Graw-Hill Company Limited, New Delhi
3. Sham Tickoo Swapna D (2009), “AUTOCAD for Engineers and Designers”, Pearson Education,
4. Venugopal (2007), “Engineering Drawing and Graphics + AUTOCAD”, New Age International Pvt. Ltd.,

REFERENCES

1. Balagopal and Prabhu (1987), “Building Drawing and Detailing”, Spades publishing KDR building, Calicut.
2. (Corresponding set of) CAD Software Theory and User Manuals.
3. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd New Asian.
4. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria & Sons,, 2010.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE345	Subject Title	Photogrammetry & Remote Sensing						
LTP	2 0 2	Credit	3	Subject Category	DE	Year	3 rd	Semester	V

Course Objective:

The course objective is to make students aware of the photogrammetry and the concepts of stereoscopy, also to learn photo interpretation techniques.

Course Pre/Co- requisite (if any) : CE208 (Engineering geology)

Detailed Syllabus

Unit 1: Fundamentals of Aerial Photogrammetry

7 L

Fundamentals of Aerial Photogrammetry: Introduction, Classification, Aerial Camera, Films and Filters, Geometrical elements of vertical photograph, Scale, Relief Displacements, photo and ground coordinates, flight planning.

Unit 2: Stereoscopy

6 L

Stereoscopic vision, Lens and Mirror stereoscope, parallax equations, Parallax bar, Measurement of heights and heights and slopes, Ground control for aerial Photography, Topo sheets, Photographs and Mosaics.

Unit 3 Aerial Photo Interpretation

4 L

Basic considerations, principles of photo interpretation, Characteristics of photographic images, Techniques of photo interpretation, photo interpretation key, Ground truth verification.

Unit-4 Principles of Remote Sensing

5 L

Sources of Energy, active and passive radiation, Electromagnetic spectrum, radiation laws, interaction of energy with atmosphere scattering, absorption, atmospheric windows, interaction of EMR with earth surface features- spectral signatures, stages in remote sensing.

Unit- 5: Remote Sensing Applications in Civil Engineering

4 L

Water Resources, Watershed Management, Environmental studies, Land use and Land Cover mapping – Urban sprawl and Transportation Network mapping, Geology and soil mapping, Ground Water Exploration.

SR.NO. EXPERIMENT NAME

1. Study of different types of satellite data products
2. Visual interpretation of satellite images of different resolutions.
3. Study of aerial photographs in 3D using stereoscope.
- 4 Extraction of thematic information from satellite images
- 5 Use of satellite images for land use mapping.

Learning Outcome

At the end of the course, the student can _:

CO1. Make measurements from aerial photographs.

CO2. Retrieve the information content of remotely sensed data.

CO3. Analyse the energy interactions in the atmosphere and earth surface features.

CO4. Understand land use and land cover mapping.

Course Structure & Syllabus of B.Tech – Civil Engineering Applicable for Batch: 2019-23

TEXT BOOKS

1. Lillesand, T. M., Kiefer, R.W., Chipman, J. W., "Remote Sensing and Image Interpretation", John Wiley & Sons Limited, Canada, 5th Edition, 2004.
2. Punmia, B. C., Jain, A. K., Jain, A. K., "Surveying", Laxmi Publications Pvt. Ltd., New Delhi, Vol. II, 12th Edition, 2005.

REFERENCES

1. Wolf P. R., Elements of Photogrammetry with Application in GIS, McGraw Hill International Book Company, 2013.
2. Moffitt, Francis H. & Mikhail, Edward M., Photogrammetry, Harper and Row Publishers, 1980.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	HS301	Subject Title	APTITUDE & SOFT SKILLS III						
LTP	3 0 0	Credit	0	Subject Category	AC	Year	III	Semester	V

Course Outline: The first step of an intensive two step placement training module equips the students to successfully handle the placement program of any on-campus/off-campus company. It not only provides career guidance about the selection process but also helps students in profile building; self-introduction and proactive internship search techniques.

Course Objective:

1. Interpret the questions of aptitude building objectively and prepare for various competitive examinations
2. Understand the optimized approach of dealing with placement questions
3. Learn ways of representing themselves effectively in formal settings

Course Pre / Co-requisite (if any): Understanding of writing concepts, general intelligence of LR, algebra concepts and equation formation, time management and presentation skills covered in Aptitude and Soft Skills I and II.

Detailed Syllabus

UNIT 1 - QUANTITATIVE APTITUDE	11 HOURS
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Number System

03 hours

Types of numbers; Factors; Divisibility test; Place and face Value; Base system; Remainder theorem; digits at the unit places and finding last two digits in a given expression; Calculating number of zeroes, Finding maximum power of any prime number or any composite number in any factorial, HCF and LCM.

Fractions–Types of fractions; Conversion of terminating and non-terminating types of decimal into fraction; Subtraction, addition and multiplication of terminating and non-terminating decimals.

Percentage

02 hours

Basic concepts; Conversion from fraction to percentage; Application of percentage in – Expenditure, Cost, Consumption problems; Population increase or decrease problems; Production, Manpower and Working hour problems; successive increment or decrement; Comparison of salary or numbers; Percentage change in area or volume, etc.

Ratio and Proportion

02 hours

Ratio, Proportion and Variation: Ratio- Introduction; Types of ratios; Comparison of Ratios; Concept of duplicate, triplicate, sub-duplicate and sub-triplicate ratios.

Proportion and variation – Concept of direct, inverse, continuous and mean proportions.

Profit and Loss

02 hours

Introduction; Concept of single, double and triple discount and marked price.

Simple / Compound Interest

02 hours

Simple Interest and compound Interest: Basic concept of Principal, Time, Amount and Rate of Interest; Concept of Lent money.

UNIT 2- VERBAL APTITUDE	09 HOURS
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Tenses

02 hours

Understanding and aligning them with the various question types.

Subject – Verb Agreement

02 hours

Subject-Verb Agreement: Rules and Applications; commonly confused words-II; Gerunds, Active and Passive voice.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Question Types

03 hours Introduction to Question types-I: Fill in the blanks, One word Substitution, Spellings, understanding the right word choice, concept of para jumbles and para completion, reading comprehension, verbal analogies, odd man out, phrases and idioms. Introduction to Question types-II: Error identification, Homophones, Usage of the various figures of speech, commonly confused words and phrases, techniques for tackling synonyms and antonyms.

Reading Comprehensions

02 hours Reading Comprehension: Basics of Comprehensions, different tones of comprehensions, cracking question types like contextual vocabulary, fill in the blanks, true/false questions, reference to context, summary and title of the passage, paraphrasing the text.

UNIT 3- LOGICAL REASONING

10 HOURS

Coding Decoding and Sequences

02 hours

Coding Decoding, Cryptarithmic, Sequence and Series - Finding the missing term/wrong term in the logical sequence of letter/number/word/alphanumeric, Continuous pattern series.

Verbal Analogies and Odd man out

02 hours

Verbal Analogy based on various parameters - Antonym / synonym relationship, Quantity and unit, Individual and Group, Product and Raw material, cause and Effect etc.

Odd man out based on several kind of relationship – Relationship based on meaning, functional relationship, even- odd or prime-composite, divisibility rule, etc.

Blood Relation and Direction Sense

02 hours Blood Relation-

Indicating form / puzzle form / coding form, Direction Sense, Direction puzzles.

Seating Arrangements

02 hours Seating Arrangements

– Linear / Circular / Distribution / comparison/ Floor and box arrangement /Quant based arrangements/ etc.

Critical Reasoning– I

02 hours

Statement and assumptions, course of action, statement and conclusion, probably true/false.

UNIT 4- NON VERBAL COMMUNICATION

04 HOURS

Types of Non Verbal Communication, Body Language-Exercises and Activities, Error Analysis & Feedback Sharing.

Suggested Activities & Exercises: (i) Communication Origami, (ii) Power of body language, (iii) Draw it.

UNIT 5- ONLINE PROFILING & SOCIAL MEDIA ETHICS

05 HOURS

Social Media ethics and etiquette, Do's & Don'ts, LinkedIn Profile Development, Example Sharing, Feedback Sharing & Error Analysis.

Suggested Activities & Exercises: (i) Online Portfolio Creation, (ii) Fun Social Media Projects, (iii) LinkedIn profile development project with feedback sharing and error analysis

LEARNING OUTCOME:

By the end of this semester, students will be able to perceive and analyse the requirements of placement trends as detailed information about the selection process would be provided by career guidance. They will be more confident and will be able to develop a professional profile, both online and offline.

Text book [TB]:

5. Quantitative Ability:How to prepare for Quantitative Aptitude, Arun Sharma, McGraw Hill, 8th edition-2018.
6. Logical Reasoning: A Modern Approach to Logical Reasoning-R.S. Aggarwal S Chand Publishing; 2ndColour edition-2018.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

7. Verbal Aptitude: English is Easy- Chetanand Singh, BSC Publication-2018.
8. Soft Skills: The Definitive Book of Body Language by Barbara and Allan Pease; RHUS; 1 edition-2006.

Reference books [RB]:

5. QA :Quantitative Aptitude for Competitive Examinations- R.S. Agarwal S. Chand Publications-2017.
QA: Quantitative Aptitude- Saurabh Rawat and Anushree Sah Rawat, Savera Publishing House, 1st Edition-2016.
6. LR: Logical Reasoning and Data Interpretation for the CAT - Nishit K Sinha, Pearson India; 5th edition-2016.
LR: Wiley's Verbal Ability and Reasoning - P A ANAND,Wiley-2016.
7. VA : Oxford Guide to English Grammar- John Eastwood, Oxford University Press-2003.
VA: Fun with grammar- Suzanne W. Woodward Pearson Education ESL-1996
8. Soft Skills :How to Talk to Anyone by Leil Lowndes Harper Element; New edition-2015.
Soft Skills: Crucial Conversations: Tools for Talking When Stakes Are High by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler; Brilliance Audio; Abridged, Updated edition-2013.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE309	Subject Title	Design of Steel Structure						
LTP	3 2 0	Credit	5	Subject Category	DC	Year	3 rd	Semester	VI

Course Objective:

The course objective is to gain the knowledge regarding design of steel structures, stability, strength and serviceability.

Course Pre/Co-requisite (if any): CE206 (Structural Analysis)

Detailed Syllabus

Unit 1: Introduction & Connections

8 L

Introduction, Types & properties of structural steel rolled sections, Grades of steel, Codal Provisions, Concept in the design of connections, Codal Provisions, Simple and moment resistant riveted, welded and bolted connections and eccentric connections

Unit 2: Tension Members

8 L

Introduction, Codal provisions, Analysis and design of tension members with different cross sections subjected to axial tension, splicing of tension member and Lug angle

Unit 3: Compression Members

12 L

Codal provisions, Slenderness ratio, Analysis and design of simple compression members (angles and I-Sections), including continuous strut and discontinuous strut. Built up compression members, Lacing and battening.

Unit-4: Flexural Members

6 L

Concept in the design of flexural member, Codal provisions, Analysis and design of laterally restrained and unrestrained beams, built up beams, Web buckling and web crippling. Introduction to lintels, purlins and castellated beams.

Unit- 5: Plate Girder

5 L

Design of plate girders including stiffeners, splices and curtailment of flange plates. Introduction to gantry girder.

Learning Outcome

At the end of the course, the student can :

CO1.Design of Structural members with different types of connections.

CO2. Design of Compression members.

CO3. Design of Beams.

CO4. Understand flexural behavior of steel components

TEXT BOOKS

1.Design of Steel structures by K.S. Sai Ram, Person Education.

2. Design of Steel Structures Vol. 1 & 2 – Ramchandra, Standard Publications.

3. Design of steel structures, Structures, S.S. Bhavikatti, I.K Publication House, New Delhi, 2010.

4. Structural Design and Drawing by N.Krishna Raju, Universities

REFERENCES

1. Limit State Design Steel Structures, S .k. Duggal, Tata Mc Grawhill.

2. Design of Steel Structures - N. Subramanian, Oxford University Press

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE311	Subject Title	Hydraulics and Hydraulic Machines						
LTP	2 0 2	Credit	3	Subject Category	DC	Year	3 rd	Semester	VI

Course Objective:

The objective of this course is to introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering.

Course Pre/Co- requisite (if any): CE201 (Fluid Mechanics)

Detailed Syllabus

Unit 1: Open Channel Flow

5 L

Definition of open channel, Geometric properties, Uniform flows in open channels: Chezy and Manning's equation, Velocity Distribution in Open Channel. Most Economical sections: Rectangle and Trapezoidal

Unit 2: Specific Energy

6 L

Specific Energy, Specific energy curve, condition for minimum specific energy and maximum discharge, Critical flow in Rectangular channels, Problems. Gradually Varied Flow, Flow profiles, Hydraulic Jump in a rectangular channels, classification of jump.

Unit 3: Impact of Jet on Vanes

5 L

Introduction to impulse momentum equation and its applications, Force exerted by a jet on a fixed target, Derivations, Force exerted by a jet on a moving target, derivations, Force exerted by a jet on a series of a curved vanes, concept of velocity triangles, equation for work done and efficiency.

Unit-4: Hydraulic Turbines

5 L

Introduction, types and classifications, Pelton wheel, equation for work done and efficiency, Specific speed, Francis turbine- Theory, equation for work done and efficiency, Design parameters, Draft tube.

Unit- 5: Centrifugal and Reciprocating Pumps

5 L

Definition of pumps and classification, Principle of working, priming and methods, Specific speed, Work done and efficiencies of centrifugal and reciprocating pumps, Minimum starting speed, Cavitation in centrifugal pumps, multistage pumps

SR.NO.

EXPERIMENT NAME

- | | |
|---|--|
| 1 | To determine the Manning's Co-efficient of roughness for a given Channel bed |
| 2 | To study the characteristics of Pelton Turbine |
| 3 | To study the characteristics of hydraulic jump |
| 4 | To find the efficiency of Francis Turbine |
| 5 | To find the efficiency of Centrifugal Pump |
| 6 | To find the efficiency of Reciprocating Pump |
| 7 | To find the coefficient of Jet Impact |

Learning Outcome

At the end of the course, the student can:

CO1. Apply their knowledge of fluid mechanics in addressing problems in open channels.

CO2. Possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions

CO3. Compute forces on Flat plate and Curved vanes by the impact of water Jet.

CO4. Solve problems related to hydraulic machineries (pumps and turbines).

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

TEXT BOOKS

1. Bansal, R. K., “Fluid Mechanics and Hydraulic Machine”, Lakshmi Publications, New Delhi.
2. Subramanya. K., “Flow in open Channel”, Tata McGraw Hill, New Delhi.
3. Rajput, R.K., “A Textbook of Fluid Mechanics and Hydraulic Machines”, S. Chand Publications, 4th Edition.

REFERENCES

5. Modi, P. N., Seth, S. M., “Hydraulics and Fluid Mechanics”, Standard Book House, New Delhi, 2004.
6. Jain, A.K., “Fluid Mechanics: Including Hydraulic Machines”, Khanna Publishers, New Delhi, 2010.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE312	Subject Title	Design of Reinforced Concrete Structures						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	3 rd	Semester	VI

Course Objective:

The course is designed to familiarize students with design concepts of reinforced structures like stair case, retaining walls, water tanks and flat slab.

Course Pre/Co- requisite (if any) : CE303 (Design of Reinforced Concrete Elements)

Detailed Syllabus

Unit 1: Design of Stair Cases

8 L

General specifications, Types of stair cases, Loads on stair cases, Effective span of stairs, Design of dog legged stair case, Design principles of other type of staircase

Unit 2: Design of Retaining Walls

8 L

General specifications, Forces acting on retaining walls, Stability consideration, Wall proportioning, Design of cantilever type retaining walls, Design of counterfort type retaining walls.

Unit 3: Design of Water Tanks

12 L

Types of water tanks, Design of circular water tanks resting on ground with rigid base, Design of circular water tanks resting on ground with flexible base, Design of overhead water tank (Intz type tank)

Unit-4: Design of Continuous Beams

5 L

Introduction to continuous beams, Design of continuous RC beams, Moment redistribution

Unit- 5: Multi-storey Building Frames

6 L

Introduction to multi-storey building frames, Analysis of multi-storey frames, Method of substitute frames

Learning Outcome

At the end of the course, the student can :

- CO1. Design the staircases, Retaining walls
- CO2. Design water tanks
- CO3. Design continuous Beams
- CO4. Design multi-storey building frames

TEXT BOOKS

1. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi
2. Pillai, S. U., Menon, D., "Design of reinforced concrete structures"- Tata McGraw hill publications, 3rd Edition, 2009.
3. Varghese, P. C., "Advanced Limit State Design of Reinforced Concrete", PHI Learning Pvt. Ltd., India

REFERENCES

1. Sinha, S. N., "Reinforced Concrete Design", Tata McGraw Hill Publications, New Delhi, 2nd Edition, 2007.
2. IS 456: 2000, "Plain and Reinforced Concrete - Code of Practice", 4th Revision, BIS, New Delhi.
3. SP 16: "Design Aid for RC to IS: 456-1978", BIS, New Delhi.
4. SP 34: "Handbook on Concrete Reinforcement and Detailing", BIS, New Delhi.
5. "Advance R.C.C. Design (R.C.C. Volume-II)" S.S. Bhavikatti, New Age Publishers

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE346	Subject Title	Traffic Engineering and Management						
LTP	2 0 2	Credit	3	Subject Category	DE	Year	3 rd	Semester	VI

Course Objective:

The objectives of this course is to familiarize the students with the concepts of transportation planning and analysis and to ensure that students are able to use the knowledge in solving real time problems in traffic engineering field.

Course Pre/Co- requisite (if any) : CE209 (Transportation Engineering-I)

Detailed Syllabus

Unit 1: Fundamentals of traffic engineering: **5 L**
 Characteristics of traffic engineering elements- vehicle, driver, road; Fundamentals of traffic flow- speed, density, flow and their relationship.

Unit 2: Traffic flow characteristics **6 L**
 Uninterrupted traffic flow- data collection, different models related to traffic flow; Interrupted traffic flow- shock wave, flow at signalized and un-signalized intersections; Delay and queue analysis.

Unit 3: Traffic facilities **7 L**
 Intersections – signalized and un-signalized. Interchanges – types, warrant. Parking – different types, Road signs, Road markings, Bus terminals.

Unit-4 Transportation planning process: **4 L**
 Goals, objectives; Transportation needs; Generation, evaluation of alternatives and their implementation.

Unit- 5:Travel demand analysis: **4 L**
 Introduction, nature and analysis of travel demand, Data collection, Four stage transportation models, Trip generation, trip distribution, modal split and traffic assignment.

SR.NO.	EXPERIMENT NAME
1	Spot speed study using speed Gun.
2	Speed –density linear relationship using Speed Gun.
3	Two Phase signal design using video data at an intersection.
4	Trip Generation analysis, using regression method.
5	Parking study characteristics.
6	Modal Choice using binary logit model using data of O-D survey.

Learning Outcome

At the end of the course, the student will be able to:

- CO1. Apply the advanced concepts of traffic engineering making them able to design various traffic facilities.
- CO2. Analyze techniques of travel demand and transportation planning.
- CO3. Analyze traffic flow characteristics
- CO4. Understand road intersection and planning

TEXT BOOKS

1. Chakroborty, P., Das, A., “Principle of Transportation Engineering”, Prentice Hall of India Pvt. Ltd.
2. Flaherty, C. A. O., “Transport Planning and Traffic Engineering”, Butterworth-Heineman.

REFERENCES

1. Roger P. Roess William R. McShane & Elena S. Prassas, Traffic Engineering, Prentice – Hall, 1990

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE347	Subject Title	Rock Mechanics						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	3 rd	Semester	VI

Course Objective:

The objectives of this course is to learn basics concepts of recognize the geological consideration needed in rock mechanics and determine and analyze physical properties, compressive strength, tensile strength, shear strength of rock.

Course Pre/Co- requisite (if any) : CE208 (Engineering geology)

Detailed Syllabus

Unit 1: Geotechnical behavior of Earth Material

6 L

Definition, importance and scope of the subject. Analysis of stress and strain at a point; Mohr's circle of stress and strain, characterization of rock joints and jointed rock masses, Intact (crystalline) rock, stratified rock, weak rock (weathered rock and soft sediments), chemically weak rock (carbonates).

Unit 2: Behavior of Soil

6 L

Factors influencing nature and formation of soils. Soil structure, types of bonds. Important clay materials. Engineering properties of soils, Genetic and engineering classification of soils, Complexity of soil nature. Permeability and flow through soil media, Soil stress and seepage, compressibility and consolidation. Stability analysis of soil slopes. Type of foundations, settlement of foundations, bearing capacity, pile foundations. Type of soils as an aggregate material.

Unit 3 Structural Geology for Site Engineering

6 L

Scope of structural geology with special reference to engineering geology. Anisotropy and heterogeneity in deformed rocks, Geometric analysis of folds, faults, joints and rock cleavages. Structural evaluation of sites of construction: Preparation and interpretation of fence diagram, Structure contour maps, Isopach and isochore maps. Joint and fracture maps, Stereographic projections. Isometric projections, block diagrams, Fence diagrams. Geomorphic and structural evaluation of river valley projects – considerations.

Unit-4 Physical and mechanical properties of rocks

6 L

Compressive, tensile, shear and triaxial strength of rock; Behaviour of rock under stress/strain and creep in rocks rheological models. Theories of rock failure: Coulmb-Navier Criteria, Griffiths criteria, Mohr's criteria. Stress concentration around an opening. Rock bursts and bumps. Subsidence - causes, prediction, monitoring and prevention case histories in Indian scenario. Determination of in-situ stresses

Unit- 5: Geotechnical Applications

2 L

Instrumentation and monitoring of stability of structure in rocks. Stabilization of weak and fractured ground - grouting and shotcreting. Numerical modeling for Geotechnical applications

Learning Outcome

At the end of the course, the student can _:

CO1. Critically review rock mechanics principles and methods and their applications to engineering practices.

CO2. Measure the physical characteristics of rock masses, including the engineering description of rocks, discontinuities and rock mass; the strength of rock substance, defects and rock mass; laboratory testing of rock, data presentation.

CO3. Analyze stresses under gravitational and imposed loads for rock engineering applications.

CO4. Predict the response of rock masses to loading (and unloading) and analyze rock slope stability and foundations on rock

CO5. Classify rock masses for engineering applications, such as tunnel design and construction.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

TEXT BOOKS

1. Fundamentals of rock mechanics by John Conrad Jaeger, Wiley India Private Ltd, 4th edition, Jan, 2012.
2. Rock mechanics and engineering by Charles Jaeger, Cambridge university press, 2nd edition
3. Engineering Rock Mechanics: An Introduction to the Principles by John A. Hudson, Elsevier Science, 2000

REFERENCES

1. Practical Rock Mechanics by Steve Hencher
2. Engineered Rock Structures in Mining and Civil Construction by Raghu N. Singh and Ajoy K. Ghose

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE348	Subject Title	Water and Land management						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	3 rd	Semester	VI

Course Objective:

The objectives of this course are to study the problems in irrigation system in our country and different types of irrigation methods. Also to understand the norms and method of land leveling for irrigation and know about drought management and water management.

Course Pre/Co- requisite (if any) : CE342 (Environmental Risk Assessment and Disaster Management)

Detailed Syllabus

Unit 1: Problems of irrigation systems in India & Soil, Water Plant Relationship **4 L**

Introduction, Problems of irrigation systems in India, Soil and Land Irrigability, classification, Basic concepts of diagnostic analysis. Evapotranspiration, crop coefficient, effective rainfall, crop water demand and availability, irrigation efficiencies.

Unit 2: Irrigation scheduling & Micro level Planning: **6 L**

Irrigation scheduling, Stressed irrigation, drought and water management policy during drought. Micro level Planning for any canal/tube well system, Evaluation of chak planning and design.

Unit 3 Water application methods & Operation and maintenance of irrigation system: 8 L

Water application methods, Border irrigation, basin irrigation, furrow irrigation, sprinkler and drip irrigation. Operation and maintenance of irrigation system, rotational water distribution systems- arabandi. Evaluation of irrigation project's performance and improvement.

Unit-4 Evaluation and status of land development: **4 L**

Evaluation and status of land development in irrigated commands, Norms of land leveling, methods of land leveling. Plane method or centroid method, contour adjustment method.

Unit- 5: Water Management for Irrigation: **4 L**

Irrigation behaviour and decision making, Attitudes and their influence on irrigation management, night irrigation, participatory irrigation management, irrigation organizations.

Learning Outcome

At the end of the course, the student can :

CO1. Understand Basic concepts of water and land management for irrigation.

CO2. Learn Different methods of Irrigation.

CO3. Learn the Drought and Water Management Policy.

CO4. Compute the Reservoir capacity by various methods and principles of reservoir operation.

TEXT BOOKS

1. Michael, A. M., "Irrigation: Theory and Practice", Vikas Publishing House Pvt Ltd, New Delhi, 2008.
2. Allen, R. G., Pereira, L. S., Raes, D., Smith, M., "FAO Irrigation and Drainage Paper: Crop Evapotranspiration (guidelines for computing crop water requirements)", No. 56, Rome, Italy.
3. FAO Irrigation and Drainage Paper no. 24 & 58, Rome, Italy.
4. Asawa, G. L., "Irrigation and Water Resources Engineering", New Age International, New Delhi, 2006.
5. Mazumdar, S. K., "Irrigation Engineering", Tata McGraw Hill Publication, New Delhi.

REFERENCES

1. Diagnostic Analysis of Minor irrigation scheme, Publication no. 11, WALMI, Aurangabad (Maharashtra).
2. Application of soil survey in Irrigation Water Management, Publication no. 21, WALMI, Aurangabad (Maharashtra).

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE349	Subject Title	Water Resource Engineering						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	3 rd	Semester	VI

Course Objective:

The objectives of this course is to understand the basic types of irrigation, irrigation standards and crop water assessment, to study the different aspects of design of unlined and lined channel and to provide knowledge on various hydraulic structures such as Weir, Barrage, Canal head and cross regulators, canal falls and structures involved in cross drainage works

Course Pre/Co- requisite (if any) : CE201 (Fluid Mechanics)

Detailed Syllabus

Unit 1: Principles of water Management 4 L

Introduction, definition, necessity of irrigation, physical properties of soils, soils classification, Indian soils, soil water relationship. Frequency of irrigation.

Water requirement of crop. Duty, delta and Base period. Quality of water for irrigation. Irrigation efficiencies.

Unit 2: Method of irrigation 5 L

Surface irrigation methods: furrow irrigation method.

Subsurface irrigation: Drip or trickle method. Overhead irrigation- types of sprinklers. Advantages and disadvantages of drip and Sprinkler irrigation. Land drainage.

Unit 3 Irrigation channels 6 L

Classification, component of canal system. Design of channels on alluvial soils Kennedy and Lacey theory.

Design of Lined channels

Unit-4 Reservoirs: 6 L

Types of reservoir, selection of site for reservoir, investigation of reservoir and dam site, Definition of general term.

Reservoir capacity from mass curve. Life of reservoir and its computation. Water losses from reservoir. Principles of reservoir operation.

Unit- 5: Head Works and Canal Structures 5 L

Layout, components, canal regulators: function and types of regulators. Canal drops component and types of canal drop.

Cross drainage works: classification ,canal outlets. Hydraulic design for a notch type of drop..

Learning Outcome

At the end of the course, the student can :

CO1. Basic requirements of irrigation and water requirements of the crops.

CO2. Various Methods of Irrigation and their advantages, disadvantages.

CO3. Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals.

CO4. Compute the Reservoir capacity by various methods and principles of reservoir operation.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

CO5. Design of various hydraulic structures such as Weir, Barrage, Canal head and cross regulators, canal falls and structures involved in cross drainage works.

TEXT BOOKS

- 1 Modi., P. N., "Irrigation water resources and water power engineering", Standard Book House, New Delhi.
- 2 Garg, S. K., "Irrigation engineering and hydraulic structures", Khanna Publishers, New Delhi, 23rd Edition, 2009.

REFERENCES

- 1 Sharma, R. K., "Text Book of Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co., New Delhi, 1984.
- 2 Sahasra Budhe, "Irrigation Engineering and Hydraulic Structures", Dhanpat Rai Publication Ltd., New Delhi.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE351	Subject Title	Ground Improvement Technique						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	3 rd	Semester	VI

Course Objective:

The course aim is to identify basic deficiencies of various soil deposits, to decide various ways and means of improving the soil and implementing techniques of improvement.

Course Pre/Co- requisite (if any) : CE211 (Soil mechanics)

Detailed Syllabus

Unit 1: Introduction to Engineering Ground Modification

4 L

Need and objectives, Identification of soil types, In situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, etc. and their applications.

Unit 2: Mechanical Modification

5 L

Principles of soil densification – Properties of Compacted soil, Compaction control tests, Specification of compaction requirements, Blasting Vibrocompaction, Dynamic Tamping and Compaction piles.

Unit 3: Hydraulic Modification

7 L

Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Filtration, Drainage and seepage control with Geosynthetics, Preloading and vertical drains, Electro-kinetic dewatering.

Unit-4: Physical and Chemical Modification

5 L

Modification by admixtures, Shotcreting and Guniting Technology, Modification at depth by grouting, Crack Grouting and compaction grouting, Jet grouting, Thermal Modification, Ground freezing.

Unit- 5:Modification by Inclusions and Confinement

5 L

Soil reinforcement, reinforcement with strip, bar, mesh, sheet and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

Learning Outcome

At the end of the course, the student can:

- CO1.Solve the field problems related to problematic soils and solve the problems using the above ground improvement techniques.
- CO2. Design drainage, dewatering for the field problems.
- CO3. Design and construct reinforced earth retaining structures.
- CO4: Design of Soil reinforcement techniques

TEXT BOOKS

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill publications
2. Mosley – Ground Improvement

REFERENCES

1. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey
2. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
3. Xianthakos, Abreimson and Bruce - Ground Control and Improvement

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE352	Subject Title	Air and Water Pollution						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	3 rd	Semester	VI

Course Objective:

The objective of this course is to learn the knowledge for various air and water pollutants, dispersion of the pollutants, mitigations measures, quality improvement and various standards.

Course Pre/Co- requisite (if any) : CE209 (Water Supply Engineering)

Detailed Syllabus

Unit 1: Introduction

5 L

Introduction and scope, air pollutant and types, classification, Dispersion and interaction of pollutants, Air pollutant chemistry and interactions at various atmospheric levels, Aerosols and its characteristics, noise pollution

Unit 2: Measurement of Air Quality and control of air pollution

6 L

Overview of Air quality, Mass balance approaches, Box model approaches, Gaussian plume model, regression model. Air quality dispersion-modeling approaches, Emission inventory, Air pollution monitoring and analysis, Different measurement methods, Key meteorological data, Plume shape, Air quality indices, Control technologies.

Unit 3: Overview of Water Pollution

5 L

Physico-chemical properties of water, molecular structure, common sources of water pollution, surface, ground, Ocean water pollution, water pollutant chemistry, pollutant transport, tracer kinetics, Eutrophication.

Unit-4: Water Pollution measurement and Treatment

5 L

Physical, chemical, biological quality parameters, quality indices for surface and ground water, interpretation of quality indices, numerical modeling approaches, treatment-primary, secondary and tertiary. Oxidation pond.

Unit- 5: Impact of air and water quality, regulations, standards

5 L

Air and water pollution versus health risk and global climate change, Ecological risk, Air and water quality standards, National and international regulations and legislations. Reclamation of water bodies, National and International regulatory bodies, Mitigation strategies.

Learning Outcome

At the end of the course, the student can:

CO1. Identify various types of air pollutants, interactions and chemistry

CO2. Have the complete knowledge about pollutant source, transport mechanism, monitoring and control technologies.

CO3. Gain the idea about pollutant monitoring organizations, environmental laws, implementation mechanisms

CO4. Gain the idea about pollutant monitoring organizations, environmental laws, implementation mechanisms

TEXT BOOKS

1. Mishra, P. C., "Fundamentals of Air and Water Pollution", APH Publishing Corporation, 2008.

2. Kenneth, W., Warner, F. C. and Davis W. T., "Air Pollution, Its Origin and Control", Prentice Hall, 3rd Edition, 1997.

REFERENCES

1. Davis, M. L. and Cornwell, D. A., "Introduction to Environmental Engineering", McGraw-Hill, 5th Edition, 2012.

2. Chin, D. A., "Water Quality Engineering in Natural Systems: Fate and Transport Processes in the Water Environment, John Wiley, 2nd Edition, 2012.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	HS304	Subject Title	Aptitude and Soft Skills IV						
LTP	3 0 0	Credit	0	Subject Category	AC	Year	III	Semester	VI

Course Outline: Aptitude and Soft Skills IV is the final step of programme and the module is designed to enhance the analytical and interpersonal skills of students to make them ready to face various placements, interviews. It will also help them learn various personality development techniques by enhancing their GD and PI skills. Mock Placement Drive will test and improve students by Feedback Sharing & Error Correction.

Course Objective:

1. Align themselves with the placement requirements and their needs
2. Learn analytical and employability skills
3. Prepare students for job placements so that they could clear the selection process successfully and give them strategies and skills to crack GD as well as PI to get selected with decent job offers

Course Pre/Co-requisite (if any):

1. Understanding grammar, number system and basic arithmetic, analytical reasoning concepts, covered in Aptitude and Soft Skills III
2. Professional profile building and Self introduction

Detailed Syllabus

UNIT 1: QUANTITATIVE APTITUDE	11 HOURS
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Partnership

02 hours

Introduction & types; Speed, Distance and Time: Average Velocity; Race tracks - Straight and Circular; Trains; Boats and Streams.

Time and Work

02 hours

Basic concepts (relationship between men, days and work); Understanding group efficiency; Alternate work; Negative work; Wages; Pipes and Cisterns.

Permutation and Combination

02 hours Basic Principles of

Counting (Addition and Multiplication); Arrangements around- Circular, Square and Rectangular tables and in straight lines, circular permutation, selection, distribution.

Probability

02 hours

Introduction, various types of events; Classical definition of probability; Random and Discrete variables; Bayes' Theorem and question types.

Data Interpretation

03 hours

Introduction; Different ways of representing data- Narration based, pictorial, pie chart, Bar graph, line charts; various questions based upon them.

UNIT 2: VERBAL APTITUDE	09 HOURS
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Cloze test

02 hours

Intricacies of cloze test, correct use of specific adjectives, concept of sentence improvement, writing concept, auxiliaries and modals.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Words **02 hours**
Concept of consistency, precision, concision in terms of reading and writing, advance word choice with respect to placement papers, SAP (Subject-Audience-Purpose) approach.

Clauses **02 hours**
Subordinate Clauses- The noun clause, the adjective clause, the adverb clause, Analysis of simple and complex sentences, prepositional phrases, transformation of sentences.

Vocabulary **01 hour**
Revisiting vocabulary- high, medium and low frequency words, organization of ideas and thoughts in order to understand the text- The Pyramid Principle.

Questions **02 hours**
Various test taking skills in accordance with the placement papers.

UNIT 3: LOGICAL REASONING	11 HOURS
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Deductive Logic **03 hours**
Premises and conclusion structure, Quality of deductive argument, Categorical arguments, Syllogism, Conditional Arguments- If..then, only if..then, If and only if, Either or.

Puzzles **02 hours**
Grouping and selection, Double line up, Binary logic- truth teller-lie teller, Team formation and miscellaneous puzzles.

Set Theory and Critical Reasoning-II **03 hours** Union and Intersection of sets, Use of Venn diagrams in problem solving with two, three, four set, concept of maxima-minima through Venn diagram.

Critical reasoning II: Statement and Inference, cause and Effects, Statement and Arguments- Strengthen or Weaken the argument, Statement Assertion and Reason.

Non-Verbal Reasoning **01 hour**
Mirror-image, Water-image, Spotting out the embedded figures, Completion of incomplete pattern, Figure matrix, Paper folding, Paper cutting, Grouping of identical figures, Counting figures, Non verbal series / analogies / odd man out.

Data Sufficiency **02 hours**
Data Sufficiency based on logical reasoning field like Coding-Decoding / Puzzle Test / Blood Relations / Mathematical calculations / clock / calendar / etc.

UNIT 4: SOFT SKILLS	08 HOURS
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Group Discussion **04 hours**
Importance, Do's & Don'ts, Personality Traits, Tips and Strategies, Types of Group Discussions.
Suggested Exercises, Games & Activities: Mock Group Discussions (on basic topics), with feedback sharing and error analysis.

Personal Interview **04 hours**
Importance, Do's & Don'ts, Personality Interview, Tips and Strategies, Etiquette Rules.
Suggested Exercises, Games & Activities: Mock Personal Interviews (contd.) with feedback sharing and error analysis.

Learning Outcomes:

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

By the end of this semester, students will:

1. Be prepared for the upcoming placements and they will also be ready for other competitive exams.
2. Improve their GD and PI Skills and be able to have firsthand experience of a Placement drive and gain sufficient confidence to perform well.

Text book [TB]:

1. Quantitative Aptitude : How to prepare for Quantitative Aptitude, Arun Sharma, McGraw Hill, 8th edition, 2018.
2. Logical Reasoning: A Modern Approach to Logical Reasoning-R.S. Aggarwal, S Chand Publishing; 2nd Colour edition-2018.
3. Verbal Aptitude : English is Easy- Chetanand Singh, BSC Publication-2018.
4. Soft Skills : Group Discussion on Current Topics by P. N. Joshi; Upkar Prakashan-2010.

Reference books [RB]:

1. Quantitative Aptitude:Quantitative Aptitude for Competitive Examinations- R.S. Agarwal, S. Chand Publications-2017.
- Quantitative Aptitude:Quantitative Aptitude-Saurabh Rawat & Anushree Sah Rawat Savera Publishing House, 1st edition-2016.
2. Logical Reasoning: Logical Reasoning and Data Interpretation for the CAT - Nishit K Sinha, Pearson India; 5th edition-2016.
Logical Reasoning: Wiley's Verbal Ability and Reasoning - P A ANAND, Wiley-2016.
 3. Verbal Aptitude: Oxford Guide to English Grammar- John Eastwood, Oxford University Press-2003.
Verbal Aptitude: Fun with grammar- Suzanne W. Woodward Pearson Education ESL-1996.
 4. Soft Skills: AComplete Kit for Group Discussion by S. Hundiwala; Arihant publications; edition-2018.
Soft Skills: Basic Interviewing Skills by Raymond L. Gorden, Waveland Press, Inc.; 1 edition-1998.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE401	Subject Title	ESTIMATION AND COSTING						
LTP	2 1 0	Credit	3	Subject Category	DC	Year	4th	Semester	VII

Course Objective: To learn the estimation of RCC, masonry and road structures and to study different terms related to contracts and tenders.

Course Pre/Co- requisite (if any) : NA

Detailed Syllabus

Unit 1: Introduction & Estimation of Buildings

4 L

Introduction - Importance of estimation in Civil Engineering, Different types of Estimates.

Estimation methods: Methods in Estimation, Methods of taking out quantities and cost by Centre line method and long wall and short wall method.

Unit 2: Estimation of R.C.C. Structures

6 L

Estimation of simple RCC structures - Estimates of components RCC works in beams, column footings and roof slabs

Estimation of complex RCC structures - Estimation of septic tank, manhole and RCC slab culverts.

Unit 3 Specifications and Rate Analysis

5 L

Specifications of items: Definition of specifications, objectives of writing specification, essentials of specification of various items of working in buildings

Rate Analysis of quantities estimated: Importance working out quantities and rates for the following standard items of works-earth works in different types of soils, cement concrete of different mixes, Brick masonry, Painting and steel works, wooden works for doors, windows

Unit-4 Estimation of Earth Work and Road Projects:

6 L

Earthwork: Methods for computation of Earthwork-cross sections-mid sections formula, trapezoidal and average end area or mean sectional formula

Road Projects: Estimation of Road Works -WBM, Bituminous mixes and cement concrete roads.

Unit- 5 Contracts and Tender

5 L

Contracts: Types of contract, essential of contracts agreement and document- legal aspects, penal provisions on breach of contract

Tender: Tender- E.M.D, Security deposit, Tender form, Tender notification procedures, Nominal muster roll, Measurement book.

COURSE OUTCOME:

At the end of the course, the student can :

CO1. Identify the various methods of estimation of quantities.

CO2. Apply the concepts to estimate the quantities required in RCC structures.

CO3. Comprehend the concepts of various construction specifications and their rates.

CO4. Compute the quantities of materials required in road construction.

CO5. Understand the role of contracts and tenders in civil engineering construction industry.

TEXT BOOKS

1. Chakraborti, M., "Estimating, Costing, Specification and Valuation in Civil Engineering", Published by author, Calcutta.
2. Dutta, B. N., "Estimating and Specification" UBS publishers and distributors, New Delhi, 2002.

REFERENCES

1. Basin, P. L., "Quality surveying", S. Chand and Co., New Delhi.
2. Rangawala, S. C., "Estimating and Specification", Charotar publishing House, Anand.
- Nanavati, J., "Professional Practice for Civil engineers".

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE402	Subject Title	BRIDGE ENGINEERING						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	4th	Semester	VII

Course Objective: The course is designed to gain the knowledge of basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location

Course Pre/Co- requisite (if any) : NA

Detailed Syllabus

Unit 1: Introduction

7 L

Definition, Components of bridge, Historical Developments, Site Selection for bridges, classification of bridges, Survey and data collection for a bridge site selection, Hydraulic design, Design Discharge, Linear waterway, Economical span.

Unit 2: Specifications of Road Bridges

10 L

Indian road Congress Bridge code, carriageway, clearance, forces on bridge, review of IRC loadings, applications of loads on bridge such as dead load, impact load, live load etc.

Unit 3: R.C.C. Slab Culvert:

8 L

RCC Slab culvert, dead load BM and SF, BM and SF for IRC class AA tracked vehicle, BM and SF for IRC class AA wheeled vehicle, BM and SF for IRC Class A loading, structural design of slab culvert.

Unit-4: T-Beam Bridge

8 L

Proportioning of components, analysis of slab using IRC class AA tracked vehicle, structural design of slab, analysis of cross girder for dead load and IRC class AA tracked vehicle, structural design of cross girder, analysis of main girder using COURBON'S method, calculation of dead load and SF, calculation of live load BM and SF using IRC class AA tracked vehicle, structural design of main girder.

Unit- 5: Substructure, Foundations, Bearings, Joints and Appurtenances

6 L

Definition of pier and abutment, design and drawing of pier and abutments, scour at abutments and pier, types of foundations, pile, well and pneumatic caissons, importance of bridge bearings, sketches of different types of bearings.

COURSE OUTCOME:

At the end of the course, the student can :

- CO1. Study different types of bridges,
- CO2. Estimate forces acting on bridges
- CO3. Design bridge.
- CO4. Design foundations and bearings

TEXT BOOKS

1. Raju, N. K., "Design of bridges", Oxford and IBH publishing Co., New Delhi.
2. Victor, J., "Essentials of bridge engineering", Oxford and IBH publishing Co., New Delhi, 3rd Edition, 1980.

REFERENCES

- 1 Bindra, S. P., "Principles and practice of bridge Engineering", Dhanpat Rai and Sons, New Delhi, 7th Edition, 1992.
- 2 "IRC 6-1966 Standard Specifications and code of practice for Road Bridges Section II loads and stresses", The Indian Road Congress, New Delhi.
3. Bridge Deck Analysis, R.P.Pama & A.R.Cusens, John Wiley & Sons.
- 4.Design of Bridge Structures, T.R.Jagadish & M.A.Jairam, Prentice Hall of India, N.Delhi.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE441	Subject Title	Pavement Evaluation and Rehabilitation						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	4th	Semester	VII

Course Objective: The objectives of this course is to introduce students to different types of pavement failures and to make students able to evaluate functional and structural condition off an existing pavement.

Course Pre/Co- requisite (if any) : CE341 (Advanced Highway Engineering)

Detailed Syllabus

Unit 1: Analysis of Pavement Structures:

4 L

Analysis of bituminous pavement- elastic half space solution, layered elastic solution. Analysis of concrete pavement-slab on elastic foundation. Stiffness modulus and fatigue performance of bituminous mix.

Unit 2: Types of pavement distress:

4 L

Introduction, major forms of distress in bituminous and concrete pavement. Distress survey.

Unit 3: Functional and structural evaluation of pavements:

7 L

Methods of Pavement evaluation. Present serviceability Index. Functional condition evaluation of pavements- Roughness, Skid Resistance and its measurement. Structural evaluation of pavements – non-destructive testing, Benkelman beam and Falling Weight Deflectometer, Lacroix Deflectometer, Dynaflect. Dynamic Cone Penetrometer Test.

Unit-4 Pavement strengthening:

5 L

Surface repairs. Overlay design and construction- need of overlays, overlay design methods for flexible and rigid pavements. Recycling of flexible and rigid pavements

Unit- 5:Pavement Systems:

6 L

Components, structure, data requirements, Project level and Network level needs, Pavement performance prediction – concepts, Pavement performance prediction – concepts, modelling techniques– AASTHO, CRRI and HDM models, Budget forecasting for maintenance and rehabilitation, Ranking and optimization methodologies, life cycle costing.

Course Outcome: At the end of the course, the student can:

- CO1. Identify principles of pavement design to be used for solving real life engineering problems.
- CO2. Apply highway engineering concepts for selection of material
- CO3. Compute various distresses occurring in case of different pavements
- CO4. Understand various pavement systems

TEXT BOOKS

1. Yodar, E. J., “Principle of Pavement Design”, Wiley, 2nd Edition.
2. Statinary Off., H. M., “Bituminous Material in Road Construction”, Road Research Laboratory, 1962.
3. Kerbs, R. D., and Walker, R. D., “Highway Materials”, McGraw-Hill, 1971

REFERENCES

1. Khanna, S. K., Justo, C. E. G., “Highway Engineering”, Nem Chand and Bros, 2001.
2. Huang, Y.H., “Pavement Analysis and Design” Prentice Hall

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE442	Subject Title	GROUND WATER ENGINEERING						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	4th	Semester	VII

Course Objective: The objectives of this course are to learn the role of groundwater and its importance over surface water. The students will also learn the Artificial Groundwater recharge processes like surface recharge and subsurface recharge processes.

Course Pre/Co- requisite (if any) : CE208 (Engineering Geology)

Detailed Syllabus

Unit 1: Introduction

5 L

Groundwater occurrence and its role in hydrologic cycle, various usage of ground water, Groundwater bearing formations, Aquifer classification, Flow and storage characteristics of various types of aquifers, Indian Scenario.

Unit 2: Ground Water Flow in Cartesian Coordinates

5 L

Differential Equations governing groundwater flow in Cartesian coordinates, Analytical solutions for confined, leaky and unconfined aquifers, Numerical solutions, Stream-aquifer interflows

Unit 3 Ground Water Flow in Polar Coordinates

8 L

Differential Equations governing groundwater flow in Polar coordinates, Analytical solutions for confined, leaky confined and unconfined aquifers, Image well theory, Time-variant pumping rates, Well interference, Analysis of pumping test data.

Unit-4: Wells and Ground Water Recharge

4 L

Construction of wells, Various drilling techniques, Estimation of recharge, Flow in unsaturated zone, Artificial recharge, Induced recharge, Roof water harvesting

Unit- 5: Contamination of Ground Water

4 L

Contamination of ground water, Quality parameters and standards, River bank infiltration, Sea water intrusion and its monitoring techniques.

Course Outcome:

At the end of the course, the student can:

- CO1. Learn the fundamentals of the Groundwater or 'the hidden asset'.
- CO2. Estimate the ability of Protection needs of groundwater and groundwater dependent receptor needs.
- CO3. Analyze Groundwater quality assessment and classification.
- CO4. Develop the quantitative skills for solving basic Groundwater related problems.
- CO5. Carry out the following: interpret cross-sections, calculate the thickness of the unsaturated zone, and the rate of groundwater flow.

TEXT BOOKS

1. Todd, D. K., "Ground Water Hydrology", John Wiley & Sons, 1980.
2. Raghunath, H. M., "Ground Water", New Age International, 2007.

REFERENCES

1. Walton, W.C., "Ground Resource Evaluation", McGraw Hill, New Delhi, 1970.
2. Bear, J., "Hydraulics of Ground Water", McGraw-Hill International Book Co., 1979.
3. Bouwer, H., "Ground Water Hydrology", McGraw-Hill

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE443	Subject Title	PRINCIPLES OF GPS & GIS						
LTP	2 0 2	Credit	3	Subject Category	DE	Year	4th	Semester	VII

Course Objective: The course objective is to introduce students to the concept of geographical information systems and enable them to understand types of GIS data, different data models and concept database management.

Course Pre/Co-requisite (if any) : CE345 (Photogrammetry and remote Sensing)

Detailed Syllabus

- Unit 1: Fundamentals of GPS** **6 L**
 Components of GPS, GPS receivers, reference coordinate systems, datums, ellipsoids, WGS 84 system, signal propagation through atmosphere- their modelling and estimation, satellite orbit.
- Unit 2: GPS Signals and Data** **6 L**
 Navigational data, GPS data collection methods: static positioning, kinematic positioning, pseudo kinematic and stop & go, observation planning and strategy.
- Unit 3 Introduction to GIS** **5 L**
 Geographical concepts and terminology, Utility of GIS, various packages and their features, essential components of a GIS. Data acquisition through scanners and digitizers, methods of digitization.
- Unit-4 Introduction to remote sensing** **6 L**
 Raster and Vector data, data storage, verification and editing. Rectification and registration, interpolation of data, Database structure: hierarchical data, network systems, relational database. Data manipulation and analysis, spatial and mathematical operations on data, area analysis, query-based analysis.
- Unit- 5: Applications of GPS & GIS** **3 L**
 Applications of GPS & GIS for engineering problems and in planning and management of various natural resources.

SR.NO.	EXPERIMENT NAME
1.	Georeferencing of a scanned map
2.	Digitization of Points and Lines
3.	Editing Map Elements
4.	Attribute Data Entry and Manipulation
5.	Cleaning, Building and Transformation
6.	Data Analysis – Overlay, Buffer
7.	Map Generation with Patterns and Legends

COURSE OUTCOME:

- At the end of the course, the student can:
- CO1: Digitize scanned maps and create informative thematic maps in GIS.
 CO2. Perform data manipulation and analysis
 CO3. Comprehend and realize the potential of GIS to address various engineering problems.
 CO4. Learn GPS

TEXT BOOKS

- The Global Positioning System & GIS: An Introduction, Michael Kennedy, Taylor and Francis publication.
- Principles of Geographic Information for Land resources assessment, P.A. Burrough and McDonnel, Oxford University Press.
- Geographic Information Systems: A Management Perspective, by Stan Arnoff, WDL Publications.

REFERENCES

- Fundamentals of Spatial Information Systems by Robert Laurini and Derek Thompson, Academic Press.
- Geographical Information Systems, Vo. I and II edited by Paul Longely, M.F. Goodchild, et.al, John Wiley and Sons, Inc. 1999

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE444	Subject Title	CONSTRUCTION PLANNING AND MANAGEMENT						
LTP	3 0 0	Credit	3	Subject Category	DE	Year	4th	Semester	VII

Course Objective: To learn network techniques in construction planning and management and to learn control and safety procedures in construction

Course Pre/Co- requisite (if any) : NA

Detailed Syllabus

Unit 1: Network Techniques

8 L

Introduction to network techniques, Use of Computer aided CPM and PERT for planning, Scheduling and control of construction works, Bar charts, Error in networks, Types of nodes and node numbering systems

Unit 2: PERT

6 L

Time Estimates, probability distribution, time computations, slack, network analysis, critical path

Unit 3 CPM

8 L

CPM processes, network, activity time estimates, float, network analysis, critical path

Unit-4 Control and Safety in Construction

8 L

Construction quality control and inspection, Significance of variability and estimation of risk, Construction cost control, crashing of networks. Resource planning and scheduling, Introduction, Evolution of safety, Cause of accident, injury. Principle of safety, safety act and regulations, roles of safety personnel, safety management system

Unit- 5 Construction Equipment and Methods

9 L

Equipment for earthworks, Concrete construction, Aggregate production, Concrete production, Handling and placement, Mixers, Vibrators and temperature control

COURSE OUTCOME:

At the end of the course, the student can:

- CO1. Identify the various network techniques for planning and scheduling any project
- CO2. Learn the concepts involved in PERT network analysis techniques
- CO3. Learn the concepts involved in CPM network analysis techniques
- CO4. Understand the importance of safety in construction projects
- CO5. Identify the various machines involved in construction projects.

TEXT BOOKS

1. Shrivastav, U. K., "Construction Planning Management", Galgotia Publications.
2. Peurifoy, R. L., "Construction Planning, Equipment and Methods", McGraw Hill Publication, New Delhi, 7th Edition, 2013.
3. Jha, K. N., "Construction Project Management: Theory and Practice", Pearson Publication, New Delhi, 2012.

REFERENCES

1. Ahuja, H. N., "Construction Performance Control by Networks", John Wiley & Sons, 1976.
2. Satyanarayana, B., Saxena, S. C., "Construction, Planning and Equipment", Standard Publishers, 3rd Edition, 1985.
3. Moder, J. J., Phillips, C. R., "Project Management with CPM and PERT", Van Nostrand Reinhold Co., 2nd Edition, 1970.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE445	Subject Title	River Pollution and Control						
LTP	3 0 0	Credit	3	Subject Category	DE	Year	4th	Semester	VII

Course Objective: The course aim is to gain the knowledge regarding river water quality, pollutant transport and to learn about the chemistry of water pollutant and pollutant management

Course Pre/Co- requisite (if any) : CE204 (Water Supply Engineering)

Detailed Syllabus

Unit 1 **6 L**
 River water quality description, river ecology. Sources of pollution, point and non-point sources of pollution, characteristics of pollutants.

Unit 2 **9 L**
 Pollutant transport and mixing in water environment, rivers, lakes and estuaries. River water quality simulation models

Unit 3 **9 L**
 River stage and pollution load relationship, interaction between ground water and surface water pollution. Theory of jets and plumes, location of outfalls, separation zones and pollutant logging,

Unit-4 **7 L**
 Hydrological character of river and pollution management. River water quality monitoring, methodologies, standards. River pollution management, Regional and local approaches.

Unit- 5 **8 L**
 River pollution management preventive and curative methods, natural energy concepts of river pollution management. Environmental regulations for river pollution control.

Course Outcome: The students will learn

- CO1. River pollution characteristics
- CO2. Pollution transport dynamics
- CO3. River pollution management
- CO3. Hydrological Characteristics of river

TEXT BOOKS

George T, 'Water quality modeling for rivers and streams', springer, 2013, first
 Jain, A K, 'River pollution', APH Publishing, 2009.

REFERENCES

Ahuja, H. N., "Construction Performance Control by Networks", John Wiley & Sons, 1976.
 Satyanarayna, B., Saxena, S. C., "Construction, Planning and Equipment", Standard Publishers, 3rd Edition, 1985.
 Moder, J. J., Phillips, C. R., "Project Management with CPM and PERT", Van Nostrand Reinhold Co., 2nd Edition, 1970.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE446	Subject Title	SOIL DYNAMICS AND MACHINE FOUNDATION						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	4th	Semester	VII

Course Objective: The course aim is the design and analysis for machine foundations come along with this course to consider the dynamic properties of both soil and foundation as combined mass. Behaviour of various geotechnical structures such as shallow and deep foundations, retaining structures due to various types of time-dependent dynamic loading are discussed here along with the reference to design code provisions.

Course Pre/Co- requisite (if any) : CE211 (Soil mechanics)

Detailed Syllabus

Unit 1: Introduction

5 L

Types of motion- SHM- Fundamental definitions- SDOF systems- Free and forced vibration with and without damping – Constant force and rotating mass type excitation –Types of damping-Equivalent stiffness of springs in series and parallel. – Resonance and its effect – magnification-logarithmic decrement –Transmissibility.

Unit 2: Theories of Vibration Analysis

4 L

EHS Theory and lumped parameter model- Different modes of vibration- Natural frequency of foundation soil system – Barkan and IS methods – Pressure bulb concept – Reisner Theory – Limitations of Reisner theory – Sung’s solutions – Pauw’s Analogy – Heigh’s Theory.

Unit 3: Dynamic principle of soil

5 L

Determination of E, G and Poissons ratio from field and laboratory tests, recommendations of Indian codes- Stress waves in bounded elastic medium- Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests.– Block vibration test – Determination of Damping factor.

Unit-4: Types of machine foundation

6 L

General requirements design – criteria for machine foundations, permissible amplitudes and bearing pressure Design data, design criteria, IS code provisions for the design foundations of reciprocating machines.

Unit- 5: Vibration isolation

6 L

Transmissibility, Principles of isolation- Methods of isolation- Vibration isolators- Types and their characterizes Special Topics: Liquefaction of soils, CSR, CRR, Factor of safety against liquefaction – Dynamic bearing capacity, Earth retaining structures under dynamic loads.

COURSE OUTCOME:

On successful completion of these course, the student able to

CO1: Use theory of vibrations to find the behavior of soil under dynamic loading.

CO2: Design machine foundations under different loads and soil conditions.

CO3: Understand the liquefaction phenomina. Conduct various laboratory and filed tests to determine the dynamic soil prosperities and its interpretation.

CO4: Design vibration isolators under any vibratory machines.

TEXT BOOKS

‘Vibrations of Soils and Foundations’ by Richart Hall and Woods

REFERENCES

‘Vibration Analysis and Foundation Dynamics’ by NSV Kameswara Rao, Wheeler Publishing, New Delhi.

‘Foundations of Machines- Analysis and Design’ by Prakash and Puri.

‘Analysis and design of Foundations for Vibrations’ by P J Moore

‘Fundamentals of Soil Dynamics’ by B M Das

‘Dynamics of bases and Foundations’ by D D Barkar

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE447	Subject Title	HYDRAULIC STRUCTURES						
LTP	2 1 0	Credit	3	Subject Category		Year	4th	Semester	VII

Course Objective:

The course enables students to learn about different hydraulic structures like dams, spillways etc.

Course Pre/Co- requisite (if any) : CE201 (Fluid Mechanics)

Detailed Syllabus

Unit 1: Introduction

4 L

Hydraulic structures for water resources projects.

Unit 2: Embankment and Gravity Dams

6 L

Embankment Dam: Types, design considerations, seepage analysis and control, stability analysis, construction techniques.

Gravity Dam: Forces acting on failure of a gravity dam, stress analysis, elementary profile, design of gravity dam, other functional features of a gravity dam

Unit 3: Spillways

6 L

Types and their design, spillway gates, Cavitation, Aerators and energy dissipation (terminal structures)

Unit-4: Channel transition

5 L

Design principles for subcritical and supercritical flows.

Unit- 5: Hydropower plant

5 L

Terms relating to hydropower, basic design aspects of different unit of hydropower plant

COURSE OUTCOME:

CO1: The student will learn classification and design of dams

CO2: The student will learn classification and design of spillways

CO3: The Student will have knowledge of hydropower plants and its parts

CO4: The Student will have knowledge of channel transition

TEXT BOOKS

1. Singh, B., "Fundamentals of Irrigation Engineering", Nem Chand & Bros, 9th Edition, 1997.
2. Subramanya, K., "Flow in Open Channels", Tata McGraw-Hill, 2nd Edition, 2000.

REFERENCES

1. Asawa, G. L., "Irrigation Engineering", New Age International, 2nd Edition, 1996.
2. Ranga Raju, K. G., "Flow through open Channels", Tata McGraw-Hill, 2003.
3. Chow, V. T., "Open Channel Hydraulics", McGraw-Hill, 1959.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CS481	Subject Title	Software Quality Engineering						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VII

UNIT-I: Introduction

(7 L)

Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics

(8 L)

Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models

(8 L)

Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance

(8 L)

Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing:

(8 L)

Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

Text Book:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley-Interscience, 2005; ISBN 0-471- 713457.
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley (2002), ISBN: 0201729156

Reference Book:

1. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley Professional
2. Taz Daughtrey, Fundamental Concepts for the Software Quality Engineer, ASQ Quality Press.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	IT353	Subject Title	Basics of Data Science						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VII

Course Objective:

1. The objective of the course is to make the students understand the different techniques for efficient mining of the data.
2. To introduce students to the concepts, processes and practice of Inference Rules at different abstraction levels of Data.
3. To provide an understanding of the Data management perspective regarding the use of business intelligence (BI), Data Mining systems and Advanced Applications.

Detailed Syllabus

UNIT 1

Data Science :Introduction to Data Science, Overview, Motivation, Data Mining-Definition & Functionalities.

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

(12L)

UNIT 2

Data Pre-Processing: Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Inconsistent Data, Data Integration and Transformation.

Data Reduction: Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Data objects and attribute types, Measuring Data Similarity and Dissimilarity, Cosine Similarity.

(7 L)

UNIT 3

Concept Description: Definition, Data Generalization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Box Plots, Measuring Dispersion of Data, Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases , FP-growth algorithm.

(7 L)

UNIT 4

Classification: What is Classification, Issues regarding Classification, Attribute selection measures, Information Gain, Gain Ratio, Gini Index, Decision tree, Naïve Bayesian Classification, Metrics for evaluating classifier performance, Confusion matrix.

(6 L)

UNIT 5

Cluster Analysis: Data types in cluster analysis, Overview of basic clustering methods, Partitioning methods: K-Means and K-medoids technique, Hierarchical Clustering: Agglomerative and Divisive, Density Based Methods :DBSCAN and OPTICS, Grid Based Methods: STING and CLIQUE, Outlier Analysis.

(8 L)

Learning Outcome

The course provides the students the ability to:

- 1 - Undertake systematic investigation/research related to the Data mining Concepts
- 2- Understand advanced Database systems and technologies for today's dynamic business environment.

Course Structure & Syllabus of B.Tech – Civil Engineering Applicable for Batch: 2019-23

Text book [TB]:

1. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier.

Reference books [RB]:

1. M.H. Dunham, "Data Mining: Introductory and Advanced Topics" Pearson Education
2. Mallach, "Data Warehousing System" , McGraw – Hill

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	IT356	Subject Title	Multimedia						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VII

Course Objective:

1. To make students learn about basic understanding of the multimedia objects and tools for object generation
2. To teach students audio and video file formats used now days as a part of IT generation.
3. To make students learn clear understanding of multimedia projects.
4. To make students learn different compression techniques.

Detailed Syllabus

UNIT 1

Introduction: Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work, Stages of Multimedia Projects, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools **(8 L)**

UNIT 2

Multimedia Building Blocks: Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture. **(8 L)**

UNIT 3

Data Compression: Introduction to data compression, Compression ratio, loss less & lossy compression, Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding ,Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77,LZ78, LZW compression. **(8 L)**

UNIT 4

Image, Audio and Video Compression: Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression, lossy graphic compression, image file format, animations Images standards, JPEG Compression, Zigzag Coding, Multimedia Database. Content based retrieval for text and images, Video Compression, MPEG standards, MHEG Standard Video Streaming on net. **(8 L)**

UNIT 5

Advanced forms of interaction in Multimedia: Video Conferencing, Elements of (immersive/non-immersive) Virtual Reality, Augmented Reality, Tele presence, Mobile technologies.
Multimedia Security: Overview- Multimedia Systems, Secured Multimedia, Digital Rights Management Systems and Technical trends, Multimedia Encryption and Digital Watermarking, Security Attacks and Multimedia Authentication. **(8 L)**

Learning Outcome

At the end of the course, Learning Outcomes Having successfully completed this course, the student will demonstrate:

1. Students will understand various multimedia tools available.
2. Students will be able to learn with Multimedia projects
3. Students can differentiate between lossy and lossless compression.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Text Book [TB]:

1. Tay Vaughan "Multimedia, Making IT Work" Osborne McGraw Hill, 7th edition
2. Khalid sayood "Introduction to data compression" Morgan Kaufmann Publishers, 3rd edition

Reference Book [RB]:

1. Buford "Multimedia Systems" Addison Wesley, 4th edition
2. Mark Nelson "Data Compression Book" BPB, 3rd edition
3. Sleinreitz "Multimedia System" Addison Wesley, 5th edition

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	EC383	Subject Title	Consumer Electronics						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VII

Objectives of the Course: The students will learn

- Consumer Electronics and its application
- Concept of audio and video related system.
- Concepts of recording and power supplies.

UNIT-I

Audio Systems: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalisers and Mixers, Electronic Music Synthesisers, Commercial Sound, Theater Sound System

8LU

UNIT – II

Video Systems and Displays: Monochrome TV, Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Video Telephone and Video Conferencing

8L

UNIT III:

Domestic Appliances: Washing machines, Microwave ovens, Air- conditioners and Refrigerators, In car computers Office Systems: FAX, Xerox, Telephone Switching System, Mobile Radio System

8L

UNIT IV:

Recording and Reproduction Systems: Disc recording and reproduction, Magnetic recording and reproduction, Video tape recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System

8L

UNIT-V

Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM

8L

Text Books:

1. Consumer Electronics S P Bali Pearson ed 2005

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Electronic systems related to consumer applications.
- Principle of working of various home appliances.
- Skills to use modern consumer electronics systems used in day to day life.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	EC385	Subject Title	Analog Electronics						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VII

Objectives of the Course: To teach the fundamental concepts of various electronic devices, circuits and their application. To develop ability among students for problem formulation, system design and solving skills.

UNIT-I

Semiconductor materials and properties Group-IV materials, Covalent bond, electron-hole concepts Basic concepts of energy bands in materials, concepts of forbidden gap Intrinsic and extrinsic semiconductors, donors and acceptors impurities **4L**

UNIT-II

Junction diode and diode applications p-n junction, depletion layer, v- i characteristics, diode resistance, capacitance diode ratings (average current, repetitive peak current, non-repetitive current, peak-inverse voltage). **4L**

Diode Applications Rectifiers (half wave and full wave), filter (C – filter), clipping circuits, clamping circuits, voltage multipliers **4L**

UNIT-III

Breakdown diodes Breakdown mechanisms (zener and avalanche), breakdown characteristics, zener diode application as shunt regulator **4L**

UNIT-IV

Bipolar Junction Transistor Basic construction, transistor action, CB, CE and CC configurations, input/output Characteristics, Transistor Amplifier Graphical analysis of CE amplifier, concept of voltage gain, current gain. **6L**

UNIT-V

Field Effect Transistor

JFET: Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristics equation CG, CS and CD configurations, MOSFET: depletion and enhancement type MOSFET-construction, operation and characteristics.

6L

Reference Books:

1. Boylestad and Nashelsky, 'Electronic Devices and Circuits' PHI, 6e, 2001.
2. A Mottershead, 'Electronic devices and circuits'. PHI, 2000.
3. Morris Mano, 'Digital Computer Design', PHI, 2003.
4. R.K. Singh & Ashish, Basic Electronics Engg. Laxmi Publication, 2007.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

5. Milman & Halkias, Integrated electronics Electronics, PHI, 2005.

OUTCOME OF THE COURSE:

- Students will be able to build, develop, model, and analyze the electronic circuits along with learning the device ratings and characteristics
- Students will be able to design and analyse electronic circuits

List of Experiments:

1. To study V-I characteristics of p-n junction diode.
2. To study V-I characteristics of zener diode.
3. To study half-wave rectifier and calculate ripple factor and efficiency.
4. To study full-wave rectifier and calculate ripple factor and efficiency.
5. To study clipper circuits.
6. To study clamper circuits.
7. To study the input and output characteristics of CB and CE transistor.
8. To study drain and transfer characteristics of JFET.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	EE481	Subject Title	NEW AND RENEWABLE ENERGY SOURCES						
LTP	3 0 0	Credit		Subject Category	Open Elective	Year	4th	Semester	VII

Objectives of the Course

- To introduce fundamentals of various renewable energy source
- To introduce fundamentals of technologies used to harness usable energy from solar, wind,
- To introduce fundamentals of technologies used to harness usable energy from ocean and Biomass energy sources.

Unit 1 **Introduction** :Energy resources and their classification, oil crisis of late 20th century and its impacts on energy planning, consumption trend of primary energy sources, world energy future, energy audit and energy conservation, energy storage. **8L**

Unit 2 **Solar Energy Conversion** :Solar resources, passage through atmosphere, solar thermal energy conversion: solar energy collectors, solar thermal power plant, solar PV conversion: solar PV cell, V-I characteristics, MPPT, Solar PV power plant and applications. **8L**

Unit 3 **Biomass Energy Conversion** : Usable forms of Bio Mass, Biomass energy resources, biomass energy conversion technologies, ethanol blended petrol and diesel, biogas plants. Energy farming. **8L**

Unit 4 **Wind Energy Conversion** : Wind Power: Energy estimation, Power extraction, lift and drag forces, horizontal axis wind turbine, vertical axis wind turbine, wind energy conversion and control schemes, environmental aspects. **8L**

Unit 5 **Other Alternate Energy Sources/Technologies:** Geothermal Energy: geothermal fields, types, geothermal energy generation systems, ocean tidal energy systems, fuel cell: basic operation and classification, principle of MHD generation, output voltage and power, environmental aspects. **8L**

Text Books:

1. B.H. Khan, Non conventional Energy Resources, 2nd edition, 2009.

Reference Books

1. G.D. Rai, Non Conventional Sources of Energy, (Khanna Publishers).
2. J.W. Twidell& A.D. Weir, Renewable Energy Resources, (ELBS / E. & F.N. Spon., London).
3. Godfrey Boyle, Renewable Energy, Oxford, 2nd edition 2010.

Outcome of the Course:

- **Identify renewable energy sources.**
- **Understand the mechanism of solar, wind and ocean energy sources.**
- **Demonstrate the understanding of various technologies involved in power generation from renewable energy sources.**

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	ME342	Subject Title	Composite Materials						
LTP	30 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VII

Course Objective: To enable the students, know and understand the mechanical behavior of composite materials

Course Pre/Co-requisite (if any): Strength of Materials, Materials Engineering

Detailed Syllabus

UNIT 1:

Definition and applications of composite materials, classifications, Fibers- glass, carbon, ceramic and aramid fibers. Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices. Fillers and whiskers. Advantages and limitations of composites

UNIT 2:

Mechanical behaviour of composite materials, surface treatment of fibers, thermosets matrix materials, Thermoplastics and other matrix materials, Manufacturing of thermoset composites, bag moulding, compression moulding, pultrusion, filament welding, other manufacturing processes

UNIT 3:

Composite mechanics Terminology, Behaviour of unidirectional composites, Behaviour of short fiber composites Analysis of orthotropic ply. Hook's Law for orthotropic lamina, Relation between Engg. constants and Elements of matrices for orthotropic ply, Transformation of Engg. constants, Failure in isotropic materials

UNIT 4:

Analysis of laminated composites, symmetric laminates, angle ply laminates, cross ply laminates, laminate, evaluation of lamina properties, determination of stress and strain in laminate, maximum stress and strain criteria, von Mises Yield criterion for isotropic materials,

UNIT 5:

Residual stresses during curing, prediction of laminate failure, thermal analysis of composite laminates. Analysis of laminated plates - equilibrium equations of motion, static bending analysis, buckling analysis, free vibrations, natural frequencies.

Learning Outcome

At the end of the course the student can:

CO1: Have an overview of the mechanical behaviour and application of composite materials.

CO2: Get an overview of the methods of manufacturing composite materials

CO3: students will understand various mechanics of composite materials.

Text book [TB]:

1. Gibson R.F. Principles of Composite Material Mechanics, second edition, McGraw Hill, 1994.
2. Hyer M.W., Stress Analysis of Fiber- Reinforced Composite Materials, McGraw Hill, 1998.

Reference books [RB]:

1. F. L. Matthews, Rees D. Rawlings , Composite Materials: Engineering and Science Woodhead Publishing, 1999 - Composite materials.
2. Autar K. Kaw, Mechanics of Composite Materials, CRC Press, 30-May-1997

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	ME445	Subject Title	Total Quality Management						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VII

Course Objective: To facilitate the understanding of total quality management principles and processes.

Course Pre/Co- requisite (if any): Manufacturing Process, Industrial Engineering and Management

Detailed Syllabus

UNIT 1:

Introduction, need for quality, evolution of quality; Definitions of quality, product quality and service quality; Basic concepts of TQM, TQM framework, contributions of Deming, Juran and Crosby. Barriers to TQM; Quality statements, customer focus, customer orientation & satisfaction, customer complaints, customer retention; costs to quality.

UNIT 2:

TQM principles; leadership, strategic quality planning; Quality councils- employee involvement, motivation; Empowerment; Team and Teamwork; Quality circles, recognition and reward, performance appraisal; Continuous process improvement; PDCE cycle, 5S, Kaizen; Supplier partnership, Partnering, Supplier rating & selection.

UNIT 3:

The seven traditional tools of quality; New management tools; Six sigma- concepts, methodology, applications to manufacturing, service sector including IT, Bench marking process; FMEA- stages, types.

UNIT 4:

TQM tools and techniques, control charts, process capability, concepts of six sigma, Quality Function Development (QFD), Taguchi quality loss function; TPM- concepts, improvement needs, performance measures.

UNIT 5:

Quality systems, need for ISO 9000, ISO 9001-9008; Quality system- elements, documentation, Quality auditing, QS 9000, ISO 14000- concepts, requirements and benefits; TQM implementation in manufacturing and service sectors.

Learning Outcome

At the end of the course the student can:

CO1: To facilitate the understanding of total quality management principles and processes.

CO2: Student will learn about ISO systems

CO3: Student will learn about various quality tools to improve products quality.

Text book [TB]:

1. Besterfield D.H. et al., Total quality Management, 3rd ed., Pearson Education Asia, 2006.
1. Evans J.R. and Lindsay W.M., The management and Control of Quality, 8th ed., first Indian edition, Cengage Learning, 2012.
2. SubburajRamasamy, McGraw-Hill Education, 2012 - Total quality management.

REFERENCES [RB]:

1. Janakiraman B. and Gopal R.K., Total Quality Management, Prentice Hall India, 2006.
2. Suganthi L. and Samuel A., Total Quality Management, Prentice Hall India, 2006.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	PE481	Subject Title	Fuel Technology						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VII

1. Course Summary

This course will introduce students to classification of fuel and their properties. In this course, students unable to understand coal preparation, coal storage process, coal gasification process. This course also covers various topics which includes Fischer Tropsch Synthesis, Gaseous and liquid fuels i.e. natural gas, producer gas, water gas, coal gas, biogas, LPG, kerosene, diesel. Students will also learn combustion mechanism for solid, liquid and gaseous fuel.

2. Course Objectives

The students should be able to:

1. Understand different types of fuel, basic terms in fuels and combustion
2. Understand the coal preparation and conversion of coal into suitable products using gasification and Fishers Tropsch Synthesis process.
3. Understand physical and chemicals properties of different types of fuel and their storage techniques, combustion mechanism
- 4.

3. Course Outcomes

A good knowledge of this course will enable students to:

1. Understand origin of different of types of fuel and their properties and classification
2. Understand the Coal preparation and storage techniques, Physical and chemical properties of coal, Briquetting and liquefaction of solid fuels
3. Understand the conversion of coal into useful products using gasification techniques and Fischer Tropsch Synthesis
4. Understand about gaseous and liquid fuels, their physical and chemical properties and Testing methods for these fuels
5. Understand about combustion mechanism for different types of fuels and Furnace elements.

4. Curriculum Content

UNIT 1

Classification of Fuel- Solid Fuels, Liquid Fuels, Gaseous Fuels, Various Terms Related to the Study of Fuels and Combustion. Coal-Origin, Composition, Petrography, Analysis and Properties of Coal, Classification of coal

UNIT 2

Coal Preparation, Coal Storage, Coal Carbonization and by-product Recovery. Physical and Chemical, Properties of Coke. Briquetting of Solid Fuels. Liquefaction of Solid Fuels

UNIT 3

Coal: A Source of Energy- Gasification of Coal. Fixed Bed Gasification, Fluidized Bed Gasification, Entrained Bed Gasification. Integrated Gasification Combined Cycle (IGCC). Underground Gasification of Coal. Indian Scenario related to Coal Gasification. Coal to Liquid (CTL) via Fischer – Tropsch (F-T) Synthesis.

UNIT 4

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Gaseous and Liquid Fuels- Natural gas, Producer gas, Water gas, Carbureted Water gas, Coal gas, Gases from biomass, LPG. Gasoline, Kerosene, Diesel. Physico Chemical Properties and Testing of Liquid Fuels. Coal Tar Fuels (CTF).

UNIT 5

Combustion: General Principle of Combustion, Combustion of Solid Fuels – Grate Firing and Pulverized Fuel Firing System. Combustion of Liquid Fuels, Burners for Liquid and Gaseous Fuels Combustion

Text book [TB]:

1. Kuo, K.K., Principles of Combustion, John Wiley and Sons, Inc. (2005).
2. Sarkar, S., Fuels and Combustion, Orient Longman, (1990).

Reference books [RB]:

1. Sharma, S.P., and Chander, M., Fuels and Combustion, Tata Mcgraw Hill (1984)

5. Teaching and Learning Strategy

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	PE482	Subject Title	Health Safety and Environment in Industry						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VII

1. Course Summary

The course will introduce students to the need and scope of health, safety and environment in industry. The students will learn about the sources and causes of pollution, effects of the pollutants on living and environment, and the safety and remedial measures that should be adopted to reduce the pollution.

2. Course Objectives

The students should be able to:

1. Understand the sources of pollutions.
2. Understand the effects of pollutions on health and environment.
3. Understand the remedial measures and safety precautions associated with each source of pollution.

3. Course Outcomes

On successful completion of the course, students have the understanding of the following:

1. Understand the scope of HSE in industry.
2. Understand the sources, effects and remedies of air pollution.
3. Understand the sources, effects and remedies of water pollution.
4. Understand the sources, effects and remedies of liquid and solid wastes.
5. Understand the sources, effects and remedies of noise pollution.

4. Curriculum Content

UNIT 1

Introduction: Man And Environment: Overview (Socio-Economic Structure & Occupational Exposures); Scope Of Environmental Engineering; Pollution Problems Due To Urbanization & Industrialization.

UNIT 2

Air Pollution : Causes Of Air Pollution; Types & Sources Of Air Pollutants; Climatic & Meteorological Effect On Air Pollution Concentration; Formation Of Smog And Fumigation; Analysis Of Air Pollutants Collection Of Gaseous Air Pollutants; Collection Of Particulate Pollutants; Analysis Of Air Pollutants Like : Sulphur Dioxide, Nitrogen Oxide, Carbon Monoxide, Oxidants & Ozone; Hydrocarbons; Particulate Matter; Control Of Particulate Emission- Control Of Gaseous Emission; Flue Gas Treatment Methods : Stacks Gravitational And Inertial Separation; Settling Chambers; Dynamic Separators; Cyclone; Filtration; Liquid Scrubbing; Spray Chambers; Packed Towers; Orifice And Venturi Scrubbers; Electrostatic Precipitators.

UNIT 3

Water Pollution & Its Control - Origin Of Waste Water – Types Of Water Pollutants And Their Effects ; Adverse Effects On: Human Health & Environment; Aquatic Life; Animal Life; Plant Life; Water Pollution Measurement Techniques; Water Pollution Control Equipments & Instruments; Indian Standards For Water Pollution Control.

UNIT 4

Liquid & Solid Wastes – Domestic & Industrial Wastes; Pesticides; Toxic: Inorganic & Organic Pollutants; Soil Deterioration; Ground Water Pollution; Concentration Of Infecting Agents In Soil; Solid Waste Disposal; Dumping Domestic & Industrial Solid Wastes; Advantages & Disadvantages; Incineration- Advantages & Disadvantages – Sanitary Land Field: Advantages & Disadvantages; Management Of Careful & Sanitary Disposal Of Solid Wastes.

UNIT 5

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Noise Pollution & Control: Intensity; Duration; Types Of Industrial Noise; Ill Effects Of Noise; Noise Measuring & Control; Permissible Noise Limits.

Text book [TB]:

1. J. Turk & A. Turk, "Environmental Science Environmental Pollution".

Reference books [RB]:

1. Odum, "Fundamental of Ecology.

5. Teaching and Learning Strategy

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	MA541	Subject Title	STATISTICAL TECHNIQUE AND APPLICATIONS						
LTP	3 0 0	Credit	3	Subject Category	Open Elective	Year	4 th	Semester	VII

OBJECTIVE: The objective of this subject is to give the basic knowledge of descriptive and mathematical part of statistics. Applications of various probability distribution in the field of insurance and finance. The course will focus on the different situations in the field of actuarial science which can be dealt with transformation of variables. The course will make able the students to understand the association between two random quantities and to find their mathematical measure.

Unit I

Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, skewness and kurtosis, Sheppard's corrections.

Unit II

Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation, rank correlation. Simple linear regression.

Unit III

Principle of least squares and fitting of polynomials and exponential curves. Theory of attributes Independence and association of attributes, consistency of data, measures of association and contingency, Yule's coefficient of colligation.

Unit IV

Testing of hypothesis: Z-test, t-test, F-test, Chi-square test for goodness of fit, Introduction to analysis of variance.

LEARNING OUTCOME: Students will able to:

- Analyze given statistical data.
- Have confidence to deal with real life situation, especially, in insurance and finance.
- Understand applications of standard probability distributions in every span of life.
- Find the association between two random quantities using mathematical theory.

Text Books:

1. Gupta, S.C. and Kapoor, V.K. (2007): Fundamental of Mathematical Statistics, 11th Edition. (Reprint), Sultan Chand & Sons.
2. Y.P. Agarwal (2012) Statistical Methods: Concepts, Application and Computation, 3rd edition; Sterling Publishers.

Reference Books:

1. Freund E F John, Mathematical statistics, 6th edition, Prentice Hall International, 1999.
2. Hogg, R. V. and Craig, T. T. (1978) Introduction to Mathematical Statistics (Fourth Edition) (Collier-McMillan).
3. Rohatgi, V. K. (1988) Introduction to Probability Theory and Mathematical Statistics (Wiley Eastern).

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Code	AR-481	Subject Title	GRAPHICS & PRODUCT DESIGN						
LTP	3 0 0	Credit	3	Subject Category	OE	Year	4 th	Semester	VII

Course Objective:

To introduce the various aspects of graphics design and important stages of product design and development.

Unit 1: Introduction

Introduction and importance of graphics and product design. Principles and elements of design. History of Design. Colour Theory. Techniques and processes to communicate graphically.

Unit 2: Product Design Cycle

Stages of product development. Introduction to ergonomics

Unit 3: Design Process

Introduction to concept. Concept development. Role of sketching in concept development. Implementation stages of concept for product development

Unit 4: Technology & Market Assessment

Customer needs identification, Market research essentials. Advertising and marketing tools.

Unit 5: Design Tools

Introduction to various design tools.

LEARNING OUTCOME:

1. The student will be able to understand the importance of Graphics.
2. The students will be able to understand and demonstrate their ideas visually.
3. The students will be able to understand the various stages of product development.

Text Books:

1. The Elements of Graphic Design, Alex W. White
2. The Design of Everyday Things, Don Norman

Reference Books:

1. Product Design & Development, Karl T. Ulrich & Steven D. Eppinger

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	ME381	Subject Title	Entrepreneurship and Startup						
LTP	2 0 2	Credit	3	Subject Category	UC	Year	4 th	Semester	VII

COURSE OBJECTIVE:

To understand the basic concepts Entrepreneurship and start up. To understand role and importance of entrepreneurship for economic development. To develop personal creativity and entrepreneurial initiative or start up.

COURSE OUTCOME

At the end of the course the student can:

CO1: Analyse the business environment in order to identify start up opportunities

CO2: Identify the elements of success of entrepreneurial ventures

CO3: Consider the legal and financial conditions for starting a start up

CO4: Evaluate the effectiveness of different entrepreneurial strategies

Unit 1:

4Hrs.

Conceptual definition of entrepreneurs, entrepreneurship and start up. Historical development of entrepreneurship. Entrepreneurship in economic theory. Entrepreneurial practice. Impact of Entrepreneurship on society. The role of entrepreneurship in economic development. Role of innovation in entrepreneurship.

Unit 2:

6Hrs.

Entrepreneurial economy. Entrepreneurship and Economic Development. Type of Entrepreneurship. Entrepreneur and small business. Features and types of entrepreneurs. Terms of entrepreneurship. Sources of business ideas. Technical and technological analysis of entrepreneurial projects. Designing a business investment. Angel Investor and Venture capitalist – Roles and Importance.

Unit 3:

5Hrs.

Forms of entrepreneurial organization. Entrepreneurial process. Entrepreneurial and start-up strategies. Role of Government agencies in Entrepreneurship development. Entrepreneurial project: entrepreneurial venture and entrepreneurial development chain. Knowledge of business economy. Group based strategies development.

Unit 4:

5Hrs.

Sources of capital. Market Research, Understanding the Market need for your concept. Defining the business concept and formulating a business plan for startup. Fundamentals of entrepreneurial management. Business process: product design, operational art, stock management.

Unit 5:

6Hrs.

Entrepreneurbiographies - the actual successes and failures. Exit strategies for entrepreneurs. Case studies of : Successful Entrepreneurial Ventures, Failed Entrepreneurial Ventures and Turnaround Ventures. Some case studies related to Product & Technology.

TEXT BOOKS:

1. S.S.Khanka, "Entrepreneurial Development". S.Chand & Co. Ltd.,10th edition, 2014.
2. Kuratko & Hodgetts, "Enterprenuership –Theory, process and practices", Thomson learning 6th edition, 2016.
3. Donald F Kuratko, "Entreprenuership – Theory, Process and Practice", 9th Edition, Cengage Learning 2014.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

REFERENCE:

1. Hisrich R D and Peters M P, "Entrepreneurship". Tata McGraw-Hill. 9th Edition, 2014.
2. Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, 1998.
3. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development" Institute of India, Ahmadabad, 1986.
4. Rajeev Roy, 'Entrepreneurship' 2nd Edition, Oxford University Press, 2011.
5. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition Dream Tech, 2005.

EVALUATION BREAKUP:

- Case study – 25 Marks (Internal)
- Assignments – 10 Marks (Internal)
- Mid Term Evaluation of Project – 10 Marks (Internal)
- Startup Idea, Seminar - 15 Marks (External)
- End Term Evaluation of Project – 40 Marks (External)

*The End Term evaluation will consist of 25 to 30 minutes' presentation followed by questionnaire by External Experts.

RESOURCE PERSONS FROM VARIOUS DEPARTMENTS:

- Mechanical Engineering
- MBA
- Computer Science Engineering.
- Information Technology.
- Industry Persons.
 1. Experts from Industry – As recommended by STPI
 2. Dr Umakant Panwar – Entrepreneur
 3. Mr Vivek Harinarian - Entrepreneur.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE405	Subject Title	EARTHQUAKE ENGINEERING						
LTP	2 1 0	Credit	3	Subject Category	DC	Year	4th	Semester	VIII

Course Objective: The course is designed to incorporate earthquake effects in analysis of structures and to learn about seismicity and various parameters related to measurement of earthquake effects.

Course Pre/Co- requisite (if any) : NA

Detailed Syllabus

Unit 1: Seismology

5 L

Earth's interior and plate tectonics, Global Seismic Belts, Seismic waves, Earthquake measurement parameters, Indian seismic zoning map, effect of soil on earthquake.

Unit 2: Single degree of freedom systems

6 L

Un-damped and Damped free vibration with viscous damping, Forced vibrations, Steady state, Vibration Isolation, Response of un-damped systems to time dependent force functions (Pulse/impulses), Duhamel's Integral, Response spectrum, DVA spectrum and construction of design spectrum.

Unit 3: Multi Degree of Freedom Systems

6 L

Mode shapes, Orthogonality of modes, of frequency and mode shapes by Holzer method, Stodola Method, Rayleigh's method.

Unit-4: Earthquake Excitation

6 L

Equivalent lateral force for Earthquake, Response spectrum method for analysis of structures and codal provisions, codal provisions for seismic isolation, Soil structure interaction.

Unit- 5: Earthquake Effects

3 L

Ground failures, Local site effects, Effects on ground and structure, Land-slides, Cracks & collapse of structures.

COURSE OUTCOME:

At the end of the course, the student can :

CO1. Apply the concepts of earthquake effects in analysis of structures.

CO2. Solve Multi Degree of Freedom systems.

CO3. Use response spectra in earthquake related problem.

CO4. Understand earthquake related effects on ground

TEXT BOOKS

1. Chopra, A.K., "Dynamic of structures", Prentice Hall, 4th Edition, 2011.

2. Paz, M., Leigh, W., "Structural Dynamics: Theory of Computation", Springer, 5th edition, 2006.

REFERENCES

Krishna, J., Chandrasekran, A.K. and Chandra, B. "Elements of Earthquake Engineering", South Asia Publisher, New Delhi, 2nd edition.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE406	Subject Title	HYDROLOGY						
LTP	2 0 0	Credit	2	Subject Category	DC	Year	4th	Semester	VIII

Course Objective: This subject aims at making the students to understand the relevance of various components of hydrologic cycle. Students will know about the spatial and temporal distribution of water availability.

Course Pre/Co-requisite (if any) : NA

Detailed Syllabus

Unit 1: Precipitation

4 L

Introduction, hydrologic cycle, water-budget equation, history of hydrology, World water balance, applications in engineering, sources of data. Definition of Precipitation, forms and types of precipitation. Measurement of rainfall using Non recording (Simon's) and Recording (Syphon) Rain Gauges. Computation of average rainfall over a Catchment area. Checking the consistency of rain fall data by double mass curve methods, computation of missing rainfall by different methods.

Unit 2: Water Losses

4 L

Introduction, types of losses. Evaporation- definition, factor affecting evaporation, methods of measurement, methods of reducing evaporation. Potential evapotranspiration, measurement, estimation of consumptive use under Indian conditions. Infiltration – definition, factor affecting, infiltration indices, measurement of infiltration

Unit 3: Runoff

8 L

Introduction, catchment area, component of runoff, factor affecting runoff, SCS-CN method of estimating runoff volume. Runoff hydrograph: components, separation of base flow, unit hydrograph theory, assumption, limitations and advantages, derivation of unit hydrograph from simple storm hydrographs, S curve and its uses.

Unit-4: Flood and Flood Routing:

6 L

Introduction, Various methods of flood discharge-Rational method, Empirical method, Unit hydrograph method, Gumbel's method, Introduction to flood routing, Basic equations, Hydrologic storage routing, Attenuation, Hydrologic channel routing- Muskingum equation, Flood control.

Unit-5: Ground Water hydrology

4 L

Basic concept of ground water, definition, occurrence and distribution, Darcy laws – transmissibility of aquifers Problems on confined and unconfined aquifer.

COURSE OUTCOME:

At the end of the course, the student can:

CO1. Understand the interaction among various processes in the hydrologic cycle.

CO2. Estimate Evapotranspiration and infiltration.

CO3. Compute Rainfall runoff using Hydrograph, SCNS-CN and S-curve methods.

CO4. Study types and classes of hydrologic simulation models and design procedures for safe and effective passage of flood.

CO5. Understand the basic aquifer parameters and estimate groundwater resources for different hydro-geological boundary conditions.

TEXT BOOKS

1. Subramanya, K., "Engineering Hydrology", Tata Mcgraw Hill, New Delhi, 4th Edition, 2013.
2. Reddy, P. J. R., "A Text Book of Hydrology", Lakshmi publication, New Delhi, 2016.
3. Patra, K. C., "Hydrology and Water Resources Engineering", Alpha Science International, Limited, 2nd Edition, 2008.

REFERENCES

1. Sharma, R.K., Sharma, T. "A Textbook of Hydrology and Water Resources Engineering", Dhanpat Rai, New Delhi, 2016
2. Raghunath, H. M., "Hydrology: Principles, Analysis & Design", New Age international (P) Ltd., New Delhi, 2nd Edition, 2014.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE448	Subject Title	PRESTRESSED CONCRETE						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	4 th	Semester	VIII

Course Objective: The course objective is to understand the need for prestressed concrete structures and to understand pre-tensioning, post-tensioning, full and partial prestressing concepts.

Course Pre/Co- requisite (if any) : CE312 (Design of Reinforced Concrete Structures)

Detailed Syllabus

Unit 1: Materials, Basic Principles of Pre-Stressing, Prestressing Systems:

4 L

Basic concepts of prestressing, High strength concrete and steel, Stress-strain characteristics and properties, Various prestressing systems, Pre-tensioning and Post-tensioning systems with anchorages, Advantages and limitations of prestressed concrete

Unit 2: Analysis of Sections for Flexure

6 L

Basic assumptions, Analysis of stresses in concrete due to pre-stress and loads for different types of cross section, Pressure line or thrust line, Cable profile, Concept of load balancing, Cracking moment

Unit 3: Losses of Pre-Stress & Deflections:

8 L

Nature of losses in pre-stress, various losses encountered in pre-tensioning and post tensioning methods, Deflection, Factors influencing deflection, Elastic deflection under transfer loads and due to different cable profile. Deflections limits as per IS-1343. Effects of creep on deflection, crack widths

Unit-4: Flexural and Shear Strength of Prestressed Concrete Sections

4 L

Types of flexural failure, IS code recommendations for flexure, Ultimate flexural strength of section. Shear and principal stresses, Ultimate shear resistance of prestressed concrete members, Shear reinforcement

Unit- 5: Transfer of Prestress in Pre tensioned Members and Anchorage Zone Stresses in Post Tensioned Members

4 L

Transmission of pre-stress in pre-tensioned members, Transmission length, Bond stresses, Codal provisions for bond and transmission length, Anchorage stress in post-tensioned member. Bearing stress and bursting tensile force, IS code provisions.

COURSE OUTCOME:

At the end of the course, the student can:

- CO1. Understand the prestressed concrete, prestressing concrete principles in addition to the difference of traditional concrete and pre stressed concrete.
- CO2. Analyze a Pre-stressed Concrete section
- CO3. Design and construct reinforced earth retaining structures.
- CO4. Design pre-tensioned and post tensioned beams for flexure and shear

TEXT BOOKS

1. Raju, N. K., "Pre-stressed concrete", Tata McGraw Hill, New Delhi, 1st Edition, 2012.
2. Ramamrutham, S., "Pre-stressed Concrete", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2003.
3. Lin, T. Y., Burns, N. H., "Design of pre-stressed Concrete Structures", John Wiley and Sons. New York, 3rd Edition, 1981.

REFERENCES

1. Pre stressed concrete by N.RajaGopalan, Nerosa Publishing house

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE449	Subject Title	ENVIRONMENTAL MANAGEMENT & SUSTAINABLE DEVELOPMENT SEMESTER - VIII						
LTP	3 0 0	Credit	3	Subject Category	DE	Year	4 th	Semester	VIII

Course Objective: The objective of this course is to learn the knowledge of Environmental monitoring, environmental economics, making of and enforcing Environmental acts for the benefits of society and also about the realistic balance between environmental quality and resource utilizations.

Course Pre/Co- requisite (if any): CE342 (Environmental Risk Assessment and Disaster Management)

Detailed Syllabus

Unit 1: Introduction

8 L

Introduction: Introduction and scope, Inter-linkages of energy-environment and economy from engineering infrastructure perspective.

Unit 2: Environmental Resources, Monitoring and Management

12 L

Environmental Resources, Monitoring and Management: Concepts of environmental components and ecology, Systems approach and sustainability engineering, Interaction between energy and environmental resources, Environmental quality standards and indices (Indian and International), Environmental monitoring, Analysis, Statistics and data interpretation, Environmental management system.

Unit 3: Environmental Laws and Policy

10 L

Environmental Laws and Policy: Introduction to environmental laws and policies, Governance, understanding climate change, carbon crediting, carbon foot print etc., Introduction to trade and environment. International environmental laws, Right to Environment as Human Right, International Humanitarian Law and Environment, environment and conflicts management, Famous international protocols like Kyoto.

Unit-4: Environmental Impact Assessment

5 L

Environmental Impact Assessment: Environmental impact assessment, Life cycle assessment, Resource Balance, Energy Balance & Management, Review; Operational Control and risk analysis of scientific and technological developments, Environmental audit.

Unit- 5: Sustainable Development

4 L

Sustainable Development: Sustainable development within the context of global economy, Technology and climate change, conservations of environmental resources.

COURSE OUTCOME:

At the end of the course, the student can:

- CO1. Identify the environmental components, interactions, scientific utilization of environmental resources
- CO2. Have the complete knowledge about the Environment economics, legislations acts, Environment Protocols
- CO3. Gain the idea about Environmental Impact Assessment
- CO4. Gain the idea about Environmental sustainable development

TEXT BOOKS

1. Mishra, P. C., "Fundamentals of Air and Water Pollution", APH Publishing Corporation, 2008.
2. Kenneth, W., Warner, F. C. and Davis W. T., "Air Pollution, Its Origin and Control", Prentice Hall, 3rd Edition, 1997.
3. Baker, S., "Sustainable Development", Routledge Publication, New York, 2008.

REFERENCES

1. Davis, M. L. and Cornwell, D. A., "Introduction to Environmental Engineering", McGraw-Hill, 5th Edition, 2012.
2. Chin, D. A., "Water Quality Engineering in Natural Systems: Fate and Transport Processes in the Water Environment, John Wiley, 2nd Edition, 2012.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE451	Subject Title	River Engineering						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	4th	Semester	VIII

Course Objective: To understand theoretical concepts of water and sediment movements in rivers. To understand the concepts of fluvial hydraulics. To introduce the flow characteristics in an alluvial channel with erodible boundary. To have knowledge of various river training works

Course Pre/Co- requisite (if any) : CE349 (Water Resource Engineering)

Detailed Syllabus

Unit 1: River Functions

4 L

Introduction, Primary function of a river, River uses and measures, Rivers in India, Himalaya and Peninsular, Types and stages of rivers

Unit 2: Sediment transport & Incipient motion

4 L

Properties of sediments, incipient motion of sediments, Shield's curve. Regimes of flow, Bed forms and channel resistance. Bed load, suspended load and Total load.

Unit 3 River Mechanics

5 L

Meandering of Rivers, Braided rivers, Degradation and aggradations of river bed, Local Scour at Bridge Piers and other Hydraulic Structures

Unit-4 River Measurements & Models :

8 L

Measurements in Rivers (Stage measurements, Channel geometry, Discharge, Sediment samplers and suspended and bed load measurement). Physical river Models (fixed and movable bed models; sectional models, distorted Models).

Unit- 5: River Protection Works

5 L

River Protection and Training Works (Revetments, Dikes, Gabions, Spurs, Bank Protective measures and Bed control structures), Design of river training and flood protection structures, River restoration.

COURSE OUTCOME:

At the end of the course, the student can :

CO1. Understand the complex behavior of rivers.

CO2. Gain the skills to take up research activities in river engineering.

CO3. Analyze and design movable boundaries channel.

CO4. Simulate behavior of River using various Mathematical Models.

CO5. Design river training structures.

TEXT BOOKS

- 3 Garde RJ and Ranga Raju KG., "Mechanics of Sediment Transportation and Alluvial Stream problem", New Age International Publishers, Revised IIIrd Edition.
- 4 Garde RJ, "River Morphology" ,New Age Publisher, Revised IInd Edition 2011.

REFERENCES

- 1 Pierre Y. Julien ., "River Mechanics" ,Cambridge University Press, 2002.
- 2 Janson PL.Ph., Lvan BendegamJvanden Berg, Mdevries A. Zanen (Editors), Principles of River Engineering – The non tidal alluvial rivers – Pitman, 1979

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE452	Subject Title	HYDRO POWER ENGINEERING						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	4th	Semester	VIII

Course Objective: The course is designed to have knowledge about Hydropower potential of India, understand power requirements, load patterns, firm power and secondary power, types of power plants and its principal component works.

Course Pre/Co- requisite (if any) : CE349 (Water Resource Engineering)

Detailed Syllabus

Unit 1: Introduction

5 L

Prospects of hydropower, Sources of energy, Hydropower potential, Distribution and development. Basin wise development of hydropower, Constraints in hydropower development

Unit 2: Stream Flow Data and Hydropower Potential

7 L

Flow and Power duration curves, Estimation of flow duration curve on un gauged site, Primary and secondary power, Storage and pondage, Load factor, Capacity factor, Utilization factor, Plant Factor Pondage Factor.

Unit 3 Types of Hydropower Plants

5 L

Classification of hydropower plants, Base and peak load hydropower plants, Detail Study of Run-of- river plants Storage power plant and Pumped-storage power plants.

Unit-4 Intake Structures and Conveyance System :

5 L

Functions of intake structures, Its locations and types, Trash rack dimensions, Design, Spacing of bars, Methods of cleaning.

Penstocks types, Design and layout, Economical diameter of penstock, Hydraulic losses, Branches, Water Hammer Pressure and Surges in Power Channel and surge tank design.

Unit- 5: Small Hydro Power Plant Development

4 L

Benefits and potential of small hydropower plants, Components of small hydropower plants, Trench weir, Desilting tank and turbines

COURSE OUTCOME:

At the end of the course, the student can :

CO1. Compare various sources of energy for power development and have knowledge about the distribution of hydropower potential in India.

CO2. Compute Firm Power by drawing Flow and Load duration Curves.

CO3. Have information about various types of hydropower plants and Power development schemes.

CO4. Design Water conductor system namely Penstock, Trash rack, Surge tanks etc,

CO5. Apply knowledge in the field of Small Hydro power development.

TEXT BOOKS

1. Sharma R.K , Sharma T.K., "A Textbook of Water Power Engineering", S Chand Publications, First Edition 2003.
2. Varsney, R. S., "Hydro Power Structures", Nem Chand & Bros, 5th Edition, 2010.
3. M.M. Dandekar and K.N. Sharma, "Water Power Engineering", Vikas Publishing House, New Delhi.

REFERENCES

1. Barrow, H. K., "Water Power Engineering", Tata McGraw-Hill.
2. Warnick, C.C., "Hydropower Engineering", Prentice Hall, 1984.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE453	Subject Title	PORT AND HARBOUR ENGINEERING						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	4th	Semester	VIII

Course Objective: The objectives of this course is to make students aware about latest mode of transportation, development of this mode in India and to enable students to learn the concepts of harbor planning.

Course Pre/Co- requisite (if any) : CE302 (Transportation Engineering II)

Detailed Syllabus

Unit 1: National Waterways **3 L**
 Inland water transportation in India, classification of waterways, economics of inland waterways transportation, national waterways

Unit 2: Harbour Planning: **6 L**
 Types of water transportation, water transportation in India, requirements of ports and harbours, classification of harbours, selection of site and planning of harbours, location of harbour, traffic estimation, master plan, ship characteristics, harbour design, turning basin, harbour entrances,

Unit 3: Docks and Repair Facilities: **6 L**
 Type of docks, its location and number, Site investigations – hydrographic survey, topographic survey, soil investigations, current observations, tidal observations, Design and construction of breakwaters, berthing structures - jetties, fenders, piers, wharves, dolphins, trestle, moles, Harbour docks, use of wet docks, design of wet docks, repair docks, lift docks, dry docks, keel and bilge blocking, construction of dry docks, gates for dry docks

Unit-4 Port facilities: **7 L**
 Port development, port planning, port building facilities, transit sheds, warehouses, cargo handling facilities, container handling terminal facilities, shipping terminals, inland port facilities. Inland waterways, Inland water transportation in India, classification of waterways, economics of inland waterways transportation, national waterways.

Unit- 5:Dredging and Coastal Protection: **4 L**
 Classification, types of dredgers, choice of dredger, uses of dredged materials, coastal erosion and protection, sea wall, revetment, bulkhead, coastal zone and beach profile.

COURSE OUTCOME:

This course will help the students in learning of :

- CO1. Working of rapidly growing transport network,
- CO2. Designing of docks and harbors.
- CO3. Managing safety issues in ports.
- CO4. Dredging and Coastal Protection

TEXT BOOKS

1. Bindra, S.P., “Docks and Harbour Engineering”, Dhanpat Rai publications, 2012
2. Srinivasan, R., “Harbour, dock and tunnel engineering”, Charotar publishing house pvt ltd, 2015
3. Oza, Gautam H. and Oza, Hasmukh P., “Dock & Harbour Engineering”, Charotar publishing house pvt ltd, 2012

REFERENCES

Subramanian, K.P., “Highway, Railway, Airport and Harbour Engineering”, Scitech publications (India) pvt.. ltd., 2010

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE454	Subject Title	STRUCTURAL GEOLOGY						
LTP	2 0 2	Credit	3	Subject Category	DE	Year	4th	Semester	VIII

Course Objective: The objectives of this course are to learn about the rock unit; thickness; lithology; and their contact relationships with other sediments or sedimentary rocks.

Course Pre/Co- requisite (if any) : CE208 (Engineering Geology)

Detailed Syllabus

Unit 1: Physical Geology

5 L

Evolution of the earth; Exogenous and endogenous processes shaping the earth. Transportation and deposition; Geological work of running water, wind, glaciers, seas and ground water; Diastrophism; Earthquakes and volcanoes, Introduction to Plate Tectonics

Unit 2: Behavior of rock

7 L

Strength Behavior of Rocks, Stress and Strain in rocks. Concept of Rock deformation & Tectonics. Forms of igneous intrusions - dyke, sill and batholith. Effects of folds and fractures on strata/orebodies and their importance in exploration activities.

Unit 3 Structural Geology

6 L

Interpretation of topographic maps; Attitude of planar and linear structures; Effects of topography on outcrops. Unconformities, folds, faults and joints - their nomenclature, classification and recognition. Principles of stereographic projection.

Unit-4 Principles of Structural Analysis

8 L

Interference patterns in superposed folding and structural geometry in superposed folding. Behavior of lineations in superposed deformations. Use of foliations and lineations in tectonic analysis. Methods of constructing profiles of folds: Convolute and evolute methods, Concentric-arc method, Kink-style construction, Dip-isogon method, Down-plunge projection method.

List of Experiments

Sr No	Details of Experiments
1	Preparation of contour maps
2	Measurement of Dip and Strike
3	Stereographic Projections of Plane
4	Stereographic Projection of Line
5	Preparation of Structural Maps
6	Formation of Profile Section
6	Three Point problem

COURSE OUTCOME:

At the end of the course, the student can :

CO1. Explain the origin and sources of the sediment and classify sediments and sedimentary rocks as well as geological structural features and their formation processes.

CO2. Understand the types of geological structural (joints, Faults, Folds), how it's formed, how we can identify and describe them.

CO3. Measure and describe the outcrop and distribution of the rock unit; thickness; lithology; and their contact relationships with other sediments or sedimentary rocks.

CO4. Understand and describe the features formed in rocks when subject to stress, analyses the strain in these rocks and interpret the palaeostress field that affected the rock and caused the deformation.

Textbooks:

Structural geology- Fundamentals and modern Developments by S. K. Ghosh, Pregamon press Ltd UK 1993

References:

Structural Geology by Marland P Billings, Phi Learning, third edition, 2000

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE455	Subject Title	STATISTICAL APPROACH TO ENVIRONMENTAL DATA ANALYSIS						
LTP	2 0 2	Credit	3	Subject Category	DE	Year	4th	Semester	VIII

Course Objective: The objective of the course to know about the basics of statistical analysis of environmental datasets and apply this knowledge for numerical modeling and forecasting of datasets.

Course Pre/Co- requisite (if any): CE342 (Environmental risk Assessment and Disaster Management)

Detailed Syllabus

Unit 1: Introduction

5 L

Introduction: Introduction to environment and various parameters, various data sources, concept of one and multidimensional datasets, concept of data matrices, temporal and spatial datasets. Various types of grids, Cartesian, spherical, cylindrical, coordinate systems.

Unit 2: Basics of data formats and plotting

7 L

Basics of data formats and plotting : Introduction to various formats of datasets, Comma Separated Values, ASCII, NetCDF format, text values, plotting of time series, scatter plot, contouring, concept of shaded contouring.

Unit 3: Regression analysis of environmental datasets

6 L

Regression analysis of environmental datasets: Regression analysis, predictor-predictand relationship, residual error, confidence intervals, t score test, null hypothesis, degrees of freedom

Unit-4: Analysis of long term datasets and identification of prominent features

4 L

Analysis of long term datasets and identification of prominent features : Eigenvalues and Eigen function, Singular value decomposition, Root mean square error, Correlation, Standard deviation, variance, skill score analysis, index calculation.

Unit- 5: Data smoothing and interpolation

4 L

Data smoothing and interpolation: Simple linear interpolation, error analysis, gridding concepts, objective analysis, Barnes and Cressman methods, concept of moving average.

SR NO.

LIST OF PRACTICAL / ASSIGNMENTS

- | | |
|----|---|
| 1 | Introduction to MATLAB, basic application of MATLAB, |
| 2 | representation of 1D, and multi- dimensional datasets, |
| 3 | creating arrays, writing script file, executing script file |
| 4 | Matrices and vectors, matrix and array operations |
| 5 | Character strings, command line functions |
| 6 | Plotting and formatting of multidimensional datasets |
| 7 | Eigenvalues, Eigen vectors, Singular Value Decomposition |
| 8 | Regression analysis, all statistical operations |
| 9 | Objective analysis, gridding from scattered datasets |
| 10 | Interpolation and moving average concepts |

COURSE OUTCOME:

At the end of the course, the student can:

- CO1. Identify the various types of environmental data, and data dimensions.
- CO2. Have the complete knowledge statistical approaches to Environmental datasets
- CO3. Gain the idea about data smoothing and interpolation
- CO4. Gain the idea about data gridding

TEXT BOOKS

1. Spiegel, M R, Stephens L J, 'Statistics Schaum Outline', Tata Mcgraw Hill Publishing Co Ltd, 2008.
2. Spiegel, M R, Schiller, J J, Srinivasan A R, 'Probability & Statistics' Tata Mcgraw Hill Publishing Co Ltd, Third edition
3. Rudra Pratap, 'Getting started with MATLAB', Oxford; Edition edition (2010).

REFERENCES

1. B L Agarwal, 'Basic Statistics', New Age International Private Limited; 6th Edition edition (1 January 2013)

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE456	Subject Title	ADVANCED STRUCTURAL DESIGN						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	4th	Semester	VIII

Course Objective:

The objective of this course is to make student capable of designing different parts of building structure

Course Pre/Co- requisite (if any) :CE303 (Design of Reinforced concrete Elements)

Detailed Syllabus

Unit 1: Analysis of Structural Element

4 L

Elastic analysis of R.C. beams and frames. Analysis and design of flat slabs; equivalent frame method, direct design method, deflection calculations.

Unit 2: Analysis of beam

6 L

Analysis and design of deep beams. Design of grid floors and cylindrical shells.

Unit 3: Analysis of Shear wall

6 L

Analysis and Design of shear walls

Unit-4: Design of building

5 L

Design of industrial buildings, bracing, gantry girders and stepped columns.

Unit- 5: Design of Tower

5 L

Microwave towers, Chimney and transmission towers. Plastic design principle, High rise building

COURSE OUTCOME:

CO1: Student will be able to design the structural elements

CO2: Student will be able to do analysis of building

CO3: Student will be able to do analysis and design of shear wall

CO4: Student will be able to do analysis and design of Tower

TEXT BOOKS

1. Jain, A. K., "Reinforced Concrete- Limit State Design", 6th Ed., Nem Chand & Bros, 2006.
2. Varghese, P. C., "Advanced Reinforced Concrete Design", Prentice Hall, 2001.
3. Pillai, S. D., Menon, D., "Reinforced Concrete Design", Tata McGraw- Hill, 2003.

REFERENCES

1. Agarwal, P., Shrinkhande, M., "Earthquake Resistance Design of Structures", Prentice- Hall of India, 2006.
2. Raju, N., K. "Advance Reinforced Concrete Design", CBS Publishers, 1986

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CE457	Subject Title	FINITE ELEMENT ANALYSIS						
LTP	2 1 0	Credit	3	Subject Category	DE	Year	4th	Semester	VIII

Course Objective: This course aims to understand the basics of Finite Element Method and its application related to engineering problems.

Course Pre/Co-requisite (if any) : CE206 (Structural Analysis)

Detailed Syllabus

Unit 1: Introduction

5 L

Basic concepts, Background review, Theory of elasticity, matrix displacement formulation, energy concepts, equilibrium and energy methods of analyzing structure, Rayleigh- Ritz method, Galerkin's method, simple application in structural analysis

Unit 2: Fundamentals of Finite element Method

7 L

Displacement function and natural coordinate's construction of displacement function for 2D truss and beam element, application for FEM for the analysis of truss, continuous beam and simple frame problems.

Unit 3: Analysis of 2D continuum Problems

6 L

Element and shape function, Triangular, rectangular and quadrilateral element, different type of element, their characteristics and suitability for application, polynomial shape function, Lagrange's and Hermitian polynomial, compatibility and convergence requirements of shape functions.

Unit-4: Theory of Isoparametric Element

4 L

Isoparametric, sub-parametric and super-parametric elements, characteristics of isoparametric quadrilateral elements.

Unit- 5: Introduction to plate bending problems and techniques

4 L

Introduction to plate bending problems and techniques for nonlinear analysis, Structure of computer program for FEM analysis, description of different modules, pre and post processing.

COURSE OUTCOME:

At the end of this course student will:

CO1: have understanding of finite element method.

CO2: know the applicability of FEM in various problems.

CO3: know the working of analysis software.

CO4: know the concepts of plate bending problems and techniques

TEXT BOOKS

1. Krishnamoorthy, C. S., "Finite Elements Analysis-Theory and Programming", Tata McGraw Hill Co. Limited, New Delhi.
2. Abel, J. F., Desai, C. S., "Introduction to the Finite element Method", Affiliated East West Press Pvt. Ltd., New Delhi.

REFERENCES

1. Bathe, K. J., "Finite Elements Procedure", PHI Pvt. Ltd, New Delhi.
2. Zienkeiwicz, O. C., "The Finite Element Method", Tata McGraw Hill Co. Limited, New Delhi.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Humanities Electives II

Subject Code	HS493	Subject Title	Indian Culture & Tradition						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VIII

Course Objective

- To promote an integral and holistic growth of young minds
- Develop a broad understanding of Indian society and intercultural literacy through cultural immersion.
- Deepen your knowledge of Indian development, environmental, and cultural issues through coursework, local engagement, and independent projects.

Unit 1 Indian Culture: An Introduction

8Hrs.

Characteristics of Indian culture, Significance of Geography on Indian Culture; Society in India through ages- Ancient period- Varna and Caste, family and marriage in India, position of women in ancient India, Contemporary period; caste system and communalism.

Unit 2 Indian Languages and Literature

6 Hrs.

Evolution of script and languages in India: Harappan Script and Brahmi Script; Short History of the Sanskrit literature: The Vedas, The Brahmins and Upanishads & Sutras, Epics: Ramayana and Mahabharata & Puranas.

Unit 3 Brief History of Indian Arts and Architecture

6Hrs.

Indian Art & Architecture: Gandhara School and Mathura School of Art; Hindu Temple Architecture, Buddhist Architecture, Medieval Architecture and Colonial Architecture.

Indian Painting Tradition: ancient, medieval, modern Indian painting and Odishan painting tradition *Performing Arts:* Divisions of Indian classical music: Hindustani and Carnatic, Dances of India: Various Dance forms: Classical and Regional, Rise of modern theatre and Indian cinema.

Unit 4 Spread of Indian Culture Abroad

6Hrs.

Causes, Significance and Modes of Cultural Exchange - Through Traders, Teachers, Emissaries, Missionaries and Gypsies, Indian Culture in South East Asia India, Central Asia and Western World through ages

COURSE OUTCOME:

- Understand background of our religion, customs institutions, administration and so on.
- Understand the present existing social, political, religious and economic conditions of the people.
- Analyze relationship between the past and the present relevance of Indian tradition.
- Develop practical skills helpful in the study and understanding of historical events.

TEXT BOOKS

- Chakravarti, Ranabir: Merchants, Merchandise & Merchantmen, in: Prakash, Om (ed.): The Trading World of the Indian Ocean, 1500-1800 (History of Science, Philosophy and Culture 361 in Indian Civilization, ed. by D.P.Chattopadhyaya.
- Chaudhuri, Kirti N.: Trade and Civilisation in the Indian Ocean, CUP, Cambridge, 1985.
- Malekandathil, Pius: Maritime India: Trade, Religion and Polity in the Indian Ocean, Primus Books, Delhi, 2010.
- McPherson, Kenneth: The early Maritime Trade of the Indian Ocean, in: ib.: The Indian Ocean: A History of People and The Sea, OUP, 1993, pp. 16-75.
- Christie, J.W., 1995, State formation In early Maritime Southeast Asia, BTLV

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Humanities Electives II

Subject Code	HS483	Subject Title	Indian Philosophy						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VIII

Course Objective

- Develop an understanding of Indian philosophical systems
- To empower for self-exploration

Unit 1 Introduction

11Hrs.

Meaning of Philosophy, Origin of Philosophy in India, Major Indian philosophical systems: Sankhya: Metaphysics, Theory of causation, Prakriti, Purusha, Evolution, Yoga: Concept of Chitta, Types and Modification of Chitta, Eight-fold Yoga & Vedant: Notions of Maya & Brahma

Unit 2 Major Principles

5Hrs.

Panchkosha, Triguna, Tridosh, Macrocosm-Microcosm

Unit 3 Major Contemporary Indian Philosophers

6Hrs.

Lord Buddha, Mahaveer, Gandhi, Vivekanand, Aurovindo-The Life Divine, Pt. Sri Ram Sharma Acharya, Vinoba & Acharya Rajneesh Osho, Paramhans Yogananda-Autobiography of a Yogi

Unit 4 Activities & Projects

4Hrs.

Identifying human prakriti, Using Trigun inventory, Understanding self

COURSE OUTCOME:

- Students will acquire understanding of concepts of Indian philosophy.
- Students will be enabled to analyze their self.
- The students will be able to relate some of the core concepts and theories of modern Indian philosophy to concepts and ideas in classical Indian philosophy.
- The students will be able to appreciate how philosophical approaches may be integrated more practically as a “way of life”.

TEXT BOOK

Chattejee, S.G. and Datta, D.M. (1960) An Introduction to Indian Philosophy, Calcutta: University of Calcutta Press

REFERENCE BOOKS

- The Yoga Sutras of Patanjali: (annotated commentary) (Divine Cool Breeze Realized Writers Book 15) by Shri Patanjali, Shri Mataji Nirmala Devi (Introduction), Charles Johnson (Translation)
- Acharya, Pt. Sri Ram Sharma (2015). Gayatri Mahavigyan. Mathura: Akhand Jyoti Prakashan.
- Vinoba, Acharya (2011). Vichar Pothi. Pawnar: Paramdham Prakashan.
- Gandhi, M.K. (2013). The story of my experiments with truth. Varanasi: Sarvodaya Prakashan.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Humanities Electives II

Subject Code	HS491	Subject Title	Industrial Sociology						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VIII

Course Objective

- The course attempts to analyze the structure and process of industrial organizations from the sociological perspective.
- The course enables students to have a general view of modern industry.

Unit 1

7Hrs.

Industrial Sociology: Nature, Scope and Importance, Origin and Development, Industry as a social, System, Development of Industry in Post-Independence period, Evolution of Working Class, Changing nature of work, Growth of unorganized informal sector., Dynamics of Industrial Relations: Approaches to the study of Industrial Relations, Collective Bargaining, – Concepts, Types, Scope and Importance.

Unit 2

7Hrs.

Industrial Disputes: Concept, Features and Kinds of disputes, Settling disputes, Mediation, Arbitration, Conciliation, Negotiation, The Indian Worker: Features of Indian worker, the contribution of social - Philosophy, family, caste and community in determining the attitude of workers

Unit 3

6Hrs.

Trade Union: Concept, Features, Functions and Types, History of Trade Union Movement in India Trade Unions and Challenges of Privatization and Globalization; Law and work, Decline of Trade Unions.

Unit 4

6Hrs.

Dynamics of Industrial Relations: Corporate Social Responsibility, Inclusion of Women in the Corporate Sector, Scope of Industrial Sociology in India; Impact on Employment, Impact on HRD, impact on wages and benefits, Modern Industry in India

COURSE OUTCOME:

- It will enable students to demonstrate the different human components that make up modern industry.
- The student will get exposed to a specialized area of sociology and its insights.
- Apply sociological concepts and theories to understand contemporary social issues and/or public debates about these issues
- Communicate sociological concepts and/or research in a manner that is appropriate for the intended audience (e.g., academic, lay audience)

TEXT BOOKS

1. Davis, Keith, 1984. Human Behaviour at work, New Delhi. Mcgraw Hill.
2. Gisbert, Ascual S J 1972. Fundamentals of Industrial Sociology, New Delhi, Tata Mc Graw-Hill.
3. Ramaswamy, E. A, 1978. Industrial Relations in India. Delhi. MacMillian
4. Pascal Gilbert: Fundamental of Industrial Sociology; Orient-Longman.
5. E.V.Schneider – Industrial sociology
6. Baviskar et al - Social Structure and Change [Vol.IV] Sage Publishers

REFERENCE BOOKS

- Sheth, N R, 1979, Industrial Sociology in India, Jaipur Rawat.
- Dutt and Sundharam 2007. Indian Economy, S Chand Publications. New Delhi: Publications.
- P. Subha Rao: Human Resource Management and Industrial Relations – Himalaya Publishing House

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Humanities Electives II

Subject Code	HS485	Subject Title	Sustainable Development						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VIII

Course Objective

- To provide the overview of sustainable and its needs to the students.
- To provide the importance and components of sustainable development to the students.
- To provide the association of social and economic development to the students.

Unit 1 Overview of Sustainable Development

5 Hrs.

History and emergence of the concept of Sustainable Development, Components of SD i.e. Economic, Social, Human, Institutional, Technological and Environmental development; Definitions, Sustainability in Ecosystem Services; natural resource degradation, greenhouse gases, factors affecting SD (i.e. Industrialization, urbanization, population growth, globalization, etc.)

Unit 2 Policies on Sustainable Development at international level

4Hrs.

Government Policies for SD in India; Socio-economic policies for sustainable development in India, Sustainable development through trade, Carrying Capacity, global policies for sustainable development

Unit 3 Sustainable Development and International Contribution

10 Hrs.

SDGs and MDGs, Complexity of growth and equity, International Summits, Conventions, Agreements, Initiations of international organizations like WHO, UNDP, WTO, FAO and World Bank towards sustainable development

Unit 4 Measurement of Sustainable Development

7Hrs.

Role of developed and developing countries in the sustainable development, Demographic dynamics and sustainability, integrated approach for resource protection and management; Index based estimation of SD i.e. Environmental Sustainable Development Index and sustainable development, and other index

Course Outcome:

- The students will be able to understand the importance of natural resource in economic development.
- The students contribute significant efforts towards sustainable development
- Develop a future-oriented perspective that highlights the significance of their decisions, choices and actions on the quality of life of present and future generations.
- Understand and are empowered to address the real causes and consequences of unsustainable behaviour within the context of an interdependent and globalised world.

TEXT BOOK

The Sustainability Revolution: Portrait of a Paradigm Shift by Edwards, Andres R., New Society Publishers, 2005.

REFERENCE BOOKS

1. The Sustainability Revolution: Portrait of a Paradigm Shift by Edwards, Andres R., New Society Publishers, 2005.
2. Sustainable development in India: Stocktaking in the run up to Rio+20: Report prepared by TERI for MoEF, 2011.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	CS482	Subject Title	Human Computer Interaction						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VIII

Unit 1

(8L)

Introduction: Importance of user Interface–definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface –popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user –Interface popularity, characteristics- Principles of user interface.

Unit 2

(7L)

Design process–Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

Unit 3

(8L)

Screen Designing: Design goals–Screen planning and purpose, organizing screen elements, ordering of screen data and content –screen navigation and flow ,Visually pleasing composition -amount of information -focus and emphasis ,presentation of information simply and meaningfully information retrieval on web - statistical graphics –Technological consideration in interface design.

Unit 4

(8L)

Windows –New and Navigation schemes selection of window, selection of devices based and screen based controls.

Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

Unit 5

(8L)

Software tools –Specification methods, interface–Building Tools.

Interaction Devices – Keyboard and function keys –pointing devices –speech recognition digitization and generation – image and video displays – drivers.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in Human Computer Interaction, Wiley, 2010.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	IT357	Subject Title	Internet of Things						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4 th	Semester	VIII

Course Outline: To provide a detailed idea how the internet is connecting the entire world and helps to live a smart life with its technology.

Course Objective:

1. Vision and Introduction to IoT.
2. Understand IoT Market perspective.
3. Data and Knowledge Management and use of Devices in IoT Technology.
4. Understand State of the Art – IoT Architecture.
5. Real World Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Pre/Co- requisite (if any): Wireless Sensor Networks

Detailed Syllabus

UNIT 1: M2M to IoT(05 Lectures)

The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, use case example, Differing Characteristics.

UNIT 2: M2M to IoT (A Market Perspective)(10 Lectures)

Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

IoT related open source software tools introduction; tools like IoTivity, IBM Blue Mix. Introduction to Contiki, Cooja, Raspberry Pi etc.

UNIT 3:M2M and IoT Technology Fundamentals(05 Lectures)

Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.

UNIT 4: IoT Architecture-State of the Art(12 Lectures)

Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model

IoT Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints- hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT 5:Industrial Automation(08 Lectures)

Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things

Commercial Building Automation: Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Learning Outcome

- Explain the definition and usage of the term 'The Internet of Things' in different contexts
- Understand where the IoT concept fits within the broader ICT industry and possible future trends
- Able to build and test a complete working IoT system Pursue lifelong learning for professional advancement.

Text book [TB]:

Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.

Reference books [RB]:

1. Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	IT359	Subject Title	Mobile Computing and Services						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4 th	Semester	VIII

Course Objective:

1. Understand the fundamentals of wireless networks.
2. Understand and evaluate emerging wireless technologies and standards
3. To explore mobile security issues
4. To explore the mobility concept.

Detailed Syllabus

UNIT 1

Introduction: Mobile computing with functions & devices, Networks, Middleware & gateways, Application & services, Developing mobile computing applications, Security & standards why it necessary, Architecture for mobile computing. (3 L)

UNIT 2

Emerging Technologies: Bluetooth, Rfid, WiMAX, Mobile IP, IPv6, GSM architecture, Call routing in GSM, Mobile computing over SMS, Value added service through SMS, GPRS architecture & operations, 3G & applications (10 L)

UNIT 3

Wireless Transmission:

Signal propagation- path loss of radio signals, additional signal propagation effects, Multipath propagation, Multiplexing- Space division, frequency division, time division, code division, Modulation- ASK, FSK, PSK, AFSK, APSK, Multi-carrier modulation
 Spread spectrum- Direct sequence & frequency hopping
 Mac- Hidden & exposed terminals, near- far terminal, SDMA, TDMA, FDMA, Fixed TDM, CSMA, PRMA, Multiple access with collision avoidance

(12 L)

UNIT 4

Wireless LAN: IEEE 802.11 in details, HIPERLAN, Link manager protocol, L2CAP, security, SDP.

(5 L)

UNIT 5

Mobility & Security in mobile computing: HTTP,

Wireless application protocol- architecture, wireless datagram protocol, wireless transport layer security, wireless transaction & session protocol, WML, Push architecture, push/ pull services, i-mode & SyncML
 Information security, Security techniques & algorithms, public key infrastructure, (10 L)

Learning Outcome

At the end of the course, Learning Outcomes Having successfully completed this course, the student will demonstrate:

- 1: Apply the fundamental design paradigms and technologies to mobile computing applications.
- 2: Develop consumer and enterprise mobile applications using representative mobile devices and platforms using modern development methodologies.
- 3: Appraise the quality and performance of mobile applications.

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4: Assess and implement security principles in mobile applications.

5: Evaluate wireless network topologies, wireless connectivity and characteristics, and the impact of wireless networks on security and Internet communications.

6: Select appropriate wireless technologies in commercial and enterprise applications.

Text book [TB]:

- Jochen H. Schiller: Mobile Communications - Second Edition, Pearson
- Asoke K Talukder & Roopa R Yavagal: Mobile Computing Technology, Applications and Service Creation – Tata McGraw-Hill Publishing Company Limited

Reference books [RB]:

- William Stallings: Wireless Communications & Networks - Second Edition, Pearson
- Theodore S. Rappaport : Wireless Communications Principles & Practice - Second Edition, Pearson

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	EC386	Subject Title	Fundamental of Communication & Networks						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4 th	Semester	VIII

Objectives of the Course:

- To understand the concept of Computer Communication.
- To learn the basics of Data communication and Networks
- To develop and design the protocol systems for advance computer communication.

UNIT I: Introduction to Communication:

Communication system, Analog and Digital Communication, channel bandwidth. Ideal and Practical Filters, Concept of Signal Distortion over a Communication Channel, Energy Signal and Power Signal, Introduction to noise in Communication systems. 6L

UNIT II: Introduction to Modulation techniques:

Concept of Amplitude Modulation, Concept of Frequency & Phase Modulation, Concept of ASK, FSK & PSK, Concepts of PCM. 8L

UNIT III: Introduction to Data Communication Network & OSI Model:

Switching systems, network hardware and software, Layering, design issues for layering, reference models and their comparison, example of networks. Concepts of OSI model. 6L

UNIT IV: Introduction to Data Communication Protocols and transmission media

MAC protocols- Aloha, CSMA, collision free protocols, Ethernet, IEEE 802.3 standard, IP protocols, IP addressing, OSPF, IPv4, IPv6. Transmission media and channel impairments, multiplexing, digital channels, switching. Repeaters, bridges, routers and gateways. 8L

Text Books:

1. Forouzan, B.A., "Data Communication and Networking", 4th Ed., Tata McGraw-Hill.
2. Tanenbaum, A.S., "Computer Networks", 4th Ed., Pearson Education.
3. Stallings W., "Data and Computer Communication", 8th Ed., Prentice-Hall.
4. Simon Haykins, 'Communication Systems', John Wiley, 5th edition

Reference Books:

1. Kurose, J.F. and Ross, K.W., "Computer Networking: A Top-Down Approach Featuring the Internet", 3rd Ed., Addison Wesley.

List of Experiments:

1. To generate amplitude modulated wave and determine the percentage modulation and Demodulate the modulated wave using envelope detector.
2. To generate AM-Double Side Band Suppressed Carrier (DSB-SC) signal.
3. To generate the SSB modulated and Demodulated wave.
4. To generate frequency modulated signal and determine the modulation index and bandwidth for various values of amplitude and frequency of modulating signal and to demodulate a FM signal
5. To study ASK modulation and Demodulation.
6. To study FSK modulation and Demodulation.
7. To study PSK modulation and Demodulation.
8. To Study TDM/PCM Transmitter /Receiver.

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Applicable for Batch: 2019-23

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Computer Communication and networks.
- Protocol design and their design issues.

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Applicable for Batch: 2019-23

Subject Code	EC382	Subject Title	Biomedical Instrumentation						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4 th	Semester	VIII

Objectives of the Course: The students will learn

- Requirement of bio-medical and its application
- Concept of bio-potential electrodes and measurements related to them.
- Concepts of bio-transducers and measurements related to them.
- Concept of bio-medical instruments and their uses experimentally.

UNIT I: ANATOMY AND PHYSIOLOGY:

Basic Cell Functions, Origin of Bio-potentials, Electrical Activity of Cells, components of man Instrument system, types of bio-medical stems, design factors and limitations of biomedical instruments, terms and transducers to various physiological events. **8L**

UNIT II: BIO-POTENTIAL ELECTRODE:

Types of bio-potential electrodes., Electrode-Electrolyte interface, half cell potential, Polarization- polarisable and non-polarisable electrodes, Ag/AgCl electrodes, Electrode circuit model; Electrode and Skin interface and motion artifact. Body surface recording electrodes for ECG. Electrodes standards. **8L**

UNIT III: BIO-TRANSDUCER:

Transduction Principles: Resistive Transducers Strain Gauge- types, construction, selection materials, Gauge factor, Bridge circuit, Temperature compensation. Strain Gauge type Blood pressure transducers. Inductive Transducers, Capacitive Transducer, Piezoelectric Transducer. **8**

UNIT IV: BIOTELEMETRY AND ELECTRICAL SAFETY:

Bio-telemetry design, single channel bio telemetry transmitter and receiver system based on AM, FM and, pulse modulation. Significance of Electrical Danger, physiological effect of current, ground shock Hazards. **8L**

Text Books:

1. Joseph J. Carr & John. M. Brown, 'Introduction to Biomedical Equipment technology'
2. R.S. Khandpur, 'Handbook of Biomedical Instrumentation', McGraw Hill.

Reference Books:

- 1 J.G. Webster, 'Medical instrumentation application and design', Houghton Mifflin Co., Boston USA.
- 2 Mohan Murali H, 'Monograph on Biomedical engineering', O.U. Press 1985.
- 3 Geddes L. A. & L. E. Baker, 'Principles of Applied Biomedical Instrumentation', Wiley, 1989.
- 4 Leslie Cromwell, Fred J. Weibell and Erich A. Pfeiffer, 'Biomedical Instrumentations and Measurements' (2nd edition), PHI, 1991.

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Bio-medical instruments and measurements.
- Principle of working of bio-medical transducers.
- Skills to use modern bio-medical tools and equipment for measurements related to human body.

LIST OF EXPERIMENTS

2. Pulse measurement
3. Heartbeat measurement

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4. Automatic BP measurement
5. Heart sound study using electronics stethoscope
6. ECG measurement

Following experiments to be done on the breadboard

7. Design of low noise and low frequency amplifier for biomedical application
8. Design of Instrumentation amplifier
9. Construction of chopper amplifier

Two Value Added Experiments to be added by Instructor.

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Applicable for Batch: 2019-23

Subject Code	EE485	Subject Title	BASIC INSTRUMENTATION AND PROCESS CONTROL						
LTP	3 0 0	Credit		Subject Category	Open Elective	Year	4th	Semester	VIII

Objectives of the Course

- To make students understand the construction, working principle and application of various transducers used for flow measurement, strain measurement, pressure and vacuum measurement,
- force, torque and power measurement
- To develop an understanding about the different types of telemetry systems used and types of instruments required for display and recording of the data to be transmitted
- Understand about components, characteristics of various control processes used and their modes of operation.

Unit 1	Transducer – I : Definition, advantages of electrical transducers, classification, characteristics, factors affecting the choice of transducers, Potentiometers, Strain gauges, Resistance thermometer, Thermistors, Thermocouples, LVDT, RVDT	8L
Unit 2	Transducer – II: Capacitive, Piezoelectric Hall effect and opto electronic transducers. Measurement of Motion, Force pressure, temperature, flow and liquid level.	8L
Unit 3	Telemetry: General telemetry system, land line & radio frequency telemetering system, transmission channels and media, receiver & transmitter. Data Acquisition System: Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system.	8L
Unit 4	Telemetry: General telemetry system, land line & radio frequency telemetering system, transmission channels and media, receiver & transmitter. Data Acquisition System: Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system.	8L
Unit 5	Display Devices and Recorders: Display devices, storage oscilloscope, spectrum analyser, strip chart & x-y recorders, magnetic tape & digital tape recorders.	
Unit 5	Process Control: Principle, elements of process control system, process characteristics, proportional (P), integral (I), Derivative (D), PI, PD and PID control modes. Electronic, Pneumatic & digital controllers.	8L

Text Books:

1. A.K.Sawhney, "Advanced Measurements & Instrumentation", Dhanpat Rai & Sons
2. B.C. Nakra & K. Chaudhry, "Instrumentation, Measurement and Analysis", Tata Mc Graw Hill 2nd Edition.
3. Curtis Johns, "Process Control Instrumentation Technology", Prentice Hall

Reference Books

1. E.O. Decblin, "Measurement System – Application & design", Mc Graw Hill.
2. W.D. Cooper and A.P. Beltried, "Electronics Instrumentation and Measurement Techniques" Prentice Hall International
3. Rajendra Prasad, "Electronic Measurement and Instrumentation Khanna Publisher
4. M.M.S. Anand, "Electronic Instruments and Instrumentation Technology" PHI Learning.

Outcome of the Course:

- Identify the appropriate instruments for measurement of different quantities.
- Ability to analyze, formulate and select suitable sensor for the given industrial applications
- Ability to analyze various control processes used and their modes of operation.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	ME382	Subject Title	Ergonomics and Value Engineering						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VIII

Course Objective: This course provides an overview on principles of ergonomics and human factors, their applications to the design and management of industrial systems, Engineering anthropometry, Human performance, human-technology interaction, work place and work station design and concept of value engineering. To address the underlying concepts, methods and application of Value Engineering

Course Pre/Co- requisite (if any):

Detailed Syllabus

UNIT 1: Introduction of Ergonomics

Background of ergonomics, historical evolution of ergonomics, definition of ergonomics, aspect of ergonomics, man machine interaction, and man machine closed loop system, man machine system (MMS)

Work physiology

Muscle structure, metabolisms, circulatory and respiratory systems, energy expenditure and workload

UNIT 2: work related MSDs risk and work postures assessment

Introduction, assessment of work postures using RULA Methods, work posture assessment using rapid entire body assessment tool (REBA)

Office Ergonomics-

Introductions, Issues in workstation design, seat design, engineering anthropometry and work design, A case study: an investigation on passenger seat design in sleeper class coaches in Indian trains.

UNIT 3: Physical stress- Introduction, vibration, occupational noise exposure, sound, source of noise and vibration, basic theory of noise measurement, Noise measuring meters, basic sound level meters, noise control , permissible limits of exposure with respect to occupational noise.

UNIT 4: Value Engineering Introduction: Definition, value engineering recommendations, programs, advantages, Evaluation of function, determining function, classifying function, evaluation of costs, evaluation of worth, determining worth, and evaluation of value.

Value Engineering Job Plan: Introduction, orientation, information phase, Function phase, creation phase, evaluation phase, Investigation phase, implementation phase, speculation phase, analysis phase.

UNIT 5: Selection of Evaluation of Value Engineering Projects: Project selection, Methods selection, value standards, application of Value Engineering methodology.

Initiating Value Engineering Program: Introduction, training plan, career development for Value Engineering specialties.

Fast Diagramming: Cost models, life cycle costs.

Value Engineering level of Effort: Value Engineering team, Co-ordinator, designer, different services, definitions, construction management contracts, value engineering case studies

Learning Outcome

At the end of the course the student can:

CO1: Specify and design ergonomically appropriate industrial workstations for the industrial and office work environment.

CO2: Identify information-centered human factors relating to visual, illumination, controls, displays and symbols.

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CO3: Compare, contrast and assess human body-centered ergonomic designs for posture, material handling, repetitive motion factors, heat stress, noise and vibration.

CO4: Define the ergonomic factors intrinsic in evaluating accidents, human errors and safety related incidents.

CO5: Student will understand the concepts, methods and application of Value Engineering

Text book [TB]:

1. Lakhwinder Pal Singh, "Work Study and Ergonomics: Cambridge University Press, 2018.
2. Value Engineering : A Systematic Approach by Arthur E. Mudge - McGraw Hill 2010

Reference books [RB]:

1. The Power of Ergonomics as a Competitive Strategy By Gross & Right (Productivity Press) 2010.
2. MartandTelsang, Industrial Engineering and Production Management, S. Chand & Compagny Limited, 2006.
3. Value Engineering A how to Manual S.S.Iyer, New age International Publishers 2009.

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Applicable for Batch: 2019-23

Subject Code	ME366	Subject Title	Product Design And Development						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4 th	Semester	VIII

Course Objective: This course aims at introducing the students to the basic concepts of engineering design and product development with focus on the front end processes. At the end of this course the student is expected to demonstrate an understanding of the overview of all the product development processes and knowledge of concept generation and selection tools.

Course Pre/Co- requisite (if any): Manufacturing Process, Industrial Engineering and Management

Detailed Syllabus

UNIT 1:

Significance of product design, Need for developing products, product design and development process, the importance of engineering design, sequential engineering design method, relevance of product lifecycle issues in design, the challenges of product development.

Product Planning and Project Selection: generic product development process, Identifying opportunities, evaluate and prioritize projects, allocation of resources, various phases of product development-planning for products.

UNIT 2:

Identifying Customer Needs voice of customer, customer populations, Interpret raw data in terms of customers need, hierarchy of human needs, need gathering methods, establish the relative importance of needs.

Product Specifications: Establish target specifications, setting final specifications

Concept Generation: Activities of concept generation, clarifying problem, search both internally and externally, explore the output

UNIT 3:

Industrial Design: Assessing need for industrial design, industrial design process, management, assessing quality of industrial design, human factors design, user friendly design

Concept Selection: Overview, concept screening and concept scoring, methods of selection, case studies.

UNIT 4:

Theory of inventive problem solving (TRIZ): Fundamentals, methods and techniques, General Theory of Innovation and TRIZ, Value engineering Applications in Product development and design, Model based technology for generating innovative ideas measurement of customers response.

Concept Testing: Elements of testing: qualitative and quantitative methods including survey.

UNIT 5:

Intellectual Property: Elements and outline, patenting procedures, claim procedure.

Design for Environment: Impact, regulations from government, ISO system, case studies.

Learning Outcome

At the end of the course the student can:

CO1:Product Design and Innovation course is intended to introduce overall awareness of the product design process.

CO2:This course will give an understanding of methods, tools and techniques applied in product design.

CO3:This course includes overview of innovation, product design process, user study, need/problem identification, development of design brief, understanding competitive benchmarking, aspects of human factors in product design, tools for creative concept generation, and prototyping/model making and evaluation techniques for user-product interaction.

CO4:This course will be explained with lectures including case studies and hands-on exercises. This will help students to generate creative ideas in to product design, considering human factors aspects.

Text book [TB]:

1. Anita Goyal, Karl T Ulrich, Steven D Eppinger, “Product Design and Development”, Tata McGraw-Hill Education, 4th Edition, 2009.

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2. Kevin Otto, Kristin Wood, "Product Design", Pearson Education, Indian Reprint 2004.

REFERENCES [RB]:

1. Yousef Haik, T. M. M. Shahin, "Engineering Design Process Cengage Learning, 2010", 2nd Edition Reprint.
2. Kevin Otto, Kristin Wood, "Product Design", Pearson Education Indian Reprint 2004.
3. Clive L.Dym, Patrick Little, "Engineering Design: A Project-based Introduction", John Wiley & Sons, 3rd Edition 2009.

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Applicable for Batch: 2019-23

Subject Code	ME452	Subject Title	Renewable Energy Sources						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VIII

Course Objective: To provide students an overview of global energy resources with focus on renewable energy sources and their importance in the context of limited supply of conventional energy resources & global warming.

Course Pre/Co- requisite (if any): Basic Thermodynamics, Heat Transfer

Detailed Syllabus

UNIT 1: ENERGY RESOURCES

Introduction: Energy & its importance in social & economic development; energy demand & supply, world energy status, energy scenario in India; energy & environment, greenhouse effect & global warming; role of renewable energy sources; a brief introduction to various renewable energy sources – hydro, solar, biomass, wind, geothermal & ocean energy – their availability & present status.

UNIT 2: SOLAR ENERGY

The sun as a source of energy, extraterrestrial & terrestrial solar radiation; solar radiation data & geometry, solar radiation on horizontal & inclined surfaces; solar thermal systems – various types of solar collectors & their applications in cooking, drying, water heating, distillation, space heating & cooling, refrigeration and power generation.

Solar photovoltaic systems, solar cell fundamentals, performance & characteristics, types of solar cells; solar cell, module, and array construction; solar PV applications.

UNIT 3: BIOMASS ENERGY

Origin of biomass, photosynthesis & generation of biomass, availability of biomass, usable forms of biomass – fuel wood, charcoal, fuel pellets, biodiesel, bioethanol, biogas and producer gas; biomass conversion technologies, thermochemical & biochemical methods, biomass gasification, classification & operational parameters of biogas plants, energy recovery from urban waste, sewage to energy conversion.

UNIT 4: WIND ENERGY

Origin & nature of winds; history of power from winds; global & local winds; estimation of wind energy at a site; maximum power extraction from wind – Betz criterion; capacity factor of wind power plants; types of wind turbines – horizontal and vertical axis wind turbines; wind energy storage; environmental & economic aspects; present status of wind energy systems.

UNIT 5: GEOTHERMAL & OCEAN ENERGY

Structure of earth's interior; origin & distribution of geothermal energy, types of geothermal resources – exploration & development of hydrothermal, geo-pressured & hot dry rock resources; electrical power generation from geothermal energy; environmental & economic considerations.

Ocean energy; tidal, wave & ocean thermal energy, energy from tidal streams (marine currents); technology for harnessing tidal & wave energy; ocean thermal energy conversion technology.

Learning Outcome

At the end of the course the student will:

CO1: Understand about the interaction between energy, economy, environment, and social development.

CO2: Appreciate the importance of renewable energy sources & future energy systems based on them.

CO3: Possess the basic technical knowledge to develop energy systems based on solar, biomass, wind, geothermal & ocean energy.

Text book [TB]:

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1. B. H. Khan, “Non-Conventional Energy Resources”, 3rd edition (2017), McGraw Hill Education (India) Private Limited, Chennai.
2. S. P. Sukhatme & J. K. Nayak, “Solar Energy”, 4th edition (2018), McGraw Hill Education (India) Private Limited, Chennai.

References [RB]:

1. G. N. Tiwari & M. K. Ghosal, “Renewable Energy Resources – Basic Principles and Applications”, 2005, Narosa Publishing House, New Delhi.
2. D.P. KOTHARI, K. C. SINGAL, RAKESH RANJAN, Renewable Energy Sources And Emerging Technologies, PHI Learning Pvt. Ltd., 25-Nov-2011.

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Applicable for Batch: 2019-23

Subject Code	PE491	Subject Title	Carbon Capture and Sequestration Technology						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VIII

1. Course Summary

The course provides information about the students to learn the basic concept and Applications of Carbon capture and storage process. In this course, students will learn about carbon capture techniques and the concept of the contribution of fossil fuel to climate change. During this course students will examine the Co₂ emission and Carbon dioxide recycling.

2. Course Objectives

The students should be able to:

1. The objective of this course is make students familiar with the principles and applications of carbon capture and storage capture techniques and role of CCS.

3. Course Outcomes

1. To acquaint the students substantially to the objectives and necessity of Carbon Sequestration and capture.
2. To introduce the contribution of fossil fuel to climate change.
3. To understand the concept of emission and recycling of CO₂.
4. To introduce the candidates to the concept of underground storage and other Carbon Capture and sequestration concepts.
5. To understand the implementation of CCS technology and IPCC.

4. Curriculum Content

UNIT 1

Introduction: Scope, Objectives and Necessity of CCS.

UNIT 2

The contribution of fossil fuels emission to Climate change and global warming. Concept of Carbon Credit and carbon footprint.

UNIT 3

Carbon capture techniques: Carbon-di-oxide emission, Scrubbing of CO₂, Carbon dioxide recycling.

UNIT 4

Carbon dioxide sequestration: Underground storage, Potential for Geologic Storage, Application in Oil and gas industry, Carbon di oxide flooding projects, Methane recovery projects.

UNIT 5

Strategy for implementing CCS technology: Modelling of Cost and Performance of CCS Plants. Role and function of IPCC.

Text book [TB]:

1. Carbon Capture; Jennifer Wilcox; Springer
2. Capturing Carbon – The new weapon in the War Against Climate Change; Mills, Robin M.; Columbia University Press

Reference books [RB]:

1. Piping and pipeline engineering, George A. Antaki, Marcel Dekker Inc. New York.
2. Fundamentals of pipeline engineering by J. Vincent Genod, Technip Editions

Course Structure & Syllabus of B.Tech – Civil Engineering Applicable for Batch: 2019-23

5. Teaching and Learning Strategy

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Subject Code	MA452	Subject Title	Optimization Techniques						
LTP	3 0 0	Credit	3	Subject Category	Open Elective	Year	4 th	Semester	VIII

Unit 1: Introduction to optimization, Statement and classification of optimization problem, Multi-objective optimization, Multi-variable optimization problem with equality and inequality constraints, Classical optimization techniques, Single variable and multivariable optimization problems, Operation Research approach, general methods for Operation Research models, methodology and advantages of Operation Research.

Unit 2: Introduction to LPP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming.

Unit 3: Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems. Sequential optimization, Representation of multistage decision process; Types of multi stage decision problems; Concept of sub optimization and the principle of optimality.

Unit 4: Optimization techniques, Memetic algorithm, Differential evolution, Evolutionary algorithms, Dynamic relaxation, Genetic algorithms, Hill climbing with random restart, Genetic Algorithm (GA), Artificial Bee Colony (ABC), Particle Swarm Optimization (PSO), Firefly algorithm, Fish School Search, Fly algorithm, Ant colony optimization algorithms

References:

1. S.S. Rao, "Engineering Optimization: Theory and Practice", New Age International P) Ltd., New Delhi, 2000.
2. G. Hadley, "Linear programming", Narosa Publishing House, New Delhi, 1990.3.
3. H.A. Taha, "Operations Research: An Introduction", 5th Edition, Macmillan, New York, 1992.4.
4. K. Deb, "Optimization for Engineering Design- Algorithms and Examples", Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.
5. S.D. Sharma, "Operations Research", Kedar Nath Ram Nath Publishers, 2009.

Course Structure & Syllabus of B.Tech – Civil Engineering

Applicable for Batch: 2019-23

Code	AR-485	Subject Title	ART APPRECIATION						
LTP	3 0 0	Credit	3	Subject Category	OE	Year	4 th	Semester	VIII

Course Objective:

To create an overview and understanding of various art forms that exists from ancient to modern times.

Unit 1: INTRODUCTION

Understanding various art forms in society and in different cultures.

Unit 2: Sociological Perspective

Relationship between art, culture and society. Influence of art forms on people.

Unit 3: Appreciation-I: Painting/ Sculptures

Understanding and appreciating films/ documentaries from past to present times and between east and west

Unit 4: Appreciation-II: Films/ Documentaries

Understanding and appreciating painting and sculptures from past to present times and between east and west

Unit 5: Appreciation-III: Indigenous/ Folk Art

Understanding and appreciating Indigenous/ Folk art from past to present times and between east and west.

LEARNING OUTCOME:

4. The student will be able to understand the various art forms.
5. The students will be able to understand and establish a relationship between art, culture and society.
6. The students will be able to appreciate the various art.

Text Books:

3. Creative Authenticity: 16 Principles to Clarify and Deepen Your Artistic Vision, Ian Roberts

Reference Books:

The Writer: A Concise Complete and Practical Text Book of Rhetoric. Designed to Aid in The Appreciation, George Lansing Raymond

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Applicable for Batch: 2019-23

Code	PY481	Subject Title	Nano scale science and technology						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4 th	Semester	VIII

Unit 1 **(10L)**

Introduction to nanotechnology, definition, history of nanotechnology, nanotechnology in relation to other branches of engineering, characteristic length scale of materials and their properties, classification of nano materials, dimensionality and size dependent phenomena, confinement in 0-D, 1-D, 2-D and 3-D, surface to volume ratio, fraction of surface atoms, surface energy.

Unit 2 **(7L)**

Nanomaterials synthesis techniques; top-down and bottom-up techniques, ball milling, PVD, CVD, self-assembly.

Unit 3 **(8L)**

Nanomaterials characterization; XRD, SEM, TEM, AFM, UV-VIS.

Unit 4 **(8L)**

Nanomaterials and their properties: carbon based nano materials, metal based nano materials, quantum dots, biological nano materials.

Unit 5 **(7L)**

Applications of nanotechnology in engineering, solar energy conversion, nanomedicine.

Text Books:

1. Poole, Jr. CP and Owens, FJ, "Introduction to Nanotechnology", Wiley India. 2006.
2. Cao, G., Nanostructures and Nanomaterials: Synthesis, Properties and Applications, Emperial College Press (2004).
3. Edward L. Wolf: Nanophysics and Nanotechnology: An Introduction to Modern Concepts in Nanoscience, 2nd ed., Wiley-VCH, 2006.