Curriculum and Syllabus
(Applicable to students admitted during AY 2021-25)

B. Tech Civil Engineering

School of Engineering and Applied Sciences

Department of Civil Engineering
SRM University, AP-Andhra Pradesh

Curriculum
B. Tech Computer Science Engineering Curriculum

Course Code	Course Name	L	T	P	C
SEMESTER-I					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
EGL 101	Communicative English	3	0	0	3
PHY 101	Engineering Physics	3	0	0	3
PHY 101L	Engineering Physics Lab	0	0	2	1
CHE 103	Chemistry for Engineers	2	0	0	2
CHE 103 L	Chemistry for Engineers Lab	0	0	2	1
MAT 112	Single Variable Calculus	3	0	0	3
ENV 111	Environmental Science	2	0	0	2
ENV 111 L	Environmental Science Lab	0	0	2	1
CSE 105	Introduction to Programming Using C	3	0	0	3
CSE 105 L	Introduction to Programming Using C Lab	0	0	2	1
ISES 101	Industry Specific Employability Skills- I	1	1	0	1
TOTAL					**21**

Course Code	Course Name	L	T	P	C
SEMESTER-II					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
ENG 115	Engineering Mechanics	3	0	0	3
CSE 107	Data Structures	3	0	0	3
CSE 107 L	Data Structures Lab	0	0	2	1
MAT 121	Multi variable Calculus	3	0	0	3
EGL 125 HIS 100	**HS Elective** Critical Thinking Idea of India	4 4	0 0	0 0	4 4
ME 103 L	Mechanical Engineering Tools Lab	0	0	2	1
ENG 106	Engineering Graphics	1	0	0	1
ENG 106 L	Engineering Graphics Lab	0	0	2	1
CE 204	Engineering Geology	3	0	0	3
CE 204 L	Engineering Geology Lab	0	0	2	1
CSE 131	Industry Standard Coding Practice - One	0	0	4	1
ISES 102	Industry Specific Employability Skills II	1	1	0	1
TOTAL					**23**

SEMESTER- III					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
CE 209	Fluid Mechanics	3	0	0	3
CE 203	Strength of Materials	3	0	0	3
CE 203 L	Strength of Materials Lab	0	0	2	1
CE 206	Surveying	3	0	0	3
CE 206 L	Surveying Lab-I	0	0	2	1
MAT 131	Differential Equations	3	0	0	3
CE 208	Building Planning & Drawing using CAD	3	0	0	3
OE	Open Elective	3	0	0/2	3/4
ISES 201	Industry Specific Employability Skills - III	1	1	0	1
CSE 232	Industry Standard Coding Practice – two	0	0	4	1
TOTAL					**22/23**

SEMESTER- IV					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
CE 201	Concrete Technology	3	0	0	3
CE 201L	Concrete Technology Lab	0	0	2	1
CE 210	Structural Analysis	3	0	0	3
CE 306	Water Resources Engineering	3	0	0	3
CE 211 L	Surveying Lab-II	0	0	2	1
MAT 221	Probability and Statistics for Engineers	3	0	0	3
CE 209 L	Fluid Mechanics and Hydraulic Machinery Lab	0	0	2	1
CE 205	Geotechnical Engineering - I	3	0	0	3
ISES 202	Industry Specific Employability Skills IV	1	1	0	1
CSE 234	Industry Standard Coding Practice -three	0	0	4	1
TOTAL					**20**

SEMESTER- V					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
CE 202	Reinforced Concrete Design	3	0	0	3
CE 302	Geotechnical Engineering-II	3	0	0	3
CE 302 L	Geotechnical Engineering Lab	0	0	2	1
CE 207	Transportation Engineering	3	0	0	3
CE 308	Environmental Engineering	3	0	0	3
CE 309	Engineering Hydrology	3	0	0	3
CE 207 L	Transportation Engineering Lab	0	0	2	1
ISES 301	Industry Specific Employability Skills V	1	1	0	0
CSE 333	Industry Standard Coding Practice - four	0	0	4	1
OE	Open Elective	3	0	0/2	3/4
TE	Technical Elective	3	0	0	3
TOTAL					**24/25**

SEMESTER- VI					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
CE 310	Estimation and Costing	3	0	0	3
TE	Technical Elective	3	0	0	3
CE 401	Design of Steel Structures	3	0	0	3
CE 308 L	Environmental Engineering Lab	0	0	2	1
CE 303	Construction Engineering and Management	3	0	0	3
CE 501	Design Project	0	0	4	2
ISES 302	Industry Specific Employability Skills VI	1	1	0	0
HS	HS elective (Professional ethics and Human Values)	2	0	0	1
OE	Open Elective	3	0	0/2	3/4
TE	Technical Elective	3	0	0	3
TOTAL					**22/23**

SEMESTER- VII					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
TE	TE Elective	3	0	0	3
TE	TE Elective	3	0	0	3
TE	TE Elective	3	0	0	3
OE	Open Elective	3	0	0/2	3/4
TOTAL					**12/13**

SEMESTER- VIII					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
CE 502	Capstone Project	0	0	24	12
OE	Open Elective	3	0	0/2	3/4
TOTAL					**15/16**

Category wise Credit Distribution

COURSE CATEGORY	Category Code	No of Courses	Credits in curriculum
Humanities and Social Sciences	HS	10	15
Basic Sciences	BS	10	22
Engineering Sciences	ES	14	25
Professional Core	C	22	51
Professional Elective	TE	6	18
Open Elective	OE	5	15/20
Project	PR	2	14
Total		**72**	**158/162**

		List of Stream Electives (Specializations)				
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
		Structural Engineering				
1	CE 405	Advanced Reinforced concrete design	3	0	0	3
2	CE 411	Prestressed Concrete	3	0	0	3
3	CE 412	Finite Element Methods	3	0	0	3
4	CE 404	Introduction to Structural Dynamics	3	0	0	3
5	CE 408	Construction Materials	3	0	2	4
6	CE 407	Advanced Structural Analysis	3	0	0	3
		Geotechnical Engineering				
1	CE 414	Advanced Foundation Engineering	3	0	0	3
2	CE 415	Ground Improvement Techniques	3	0	0	3
3	CE 416	Designing with Geosynthetics	3	0	0	3
4	CE 425	Earth Retaining structures	3	0	0	3
5	CE 428	Soil dynamics	3	0	0	3
6	CE 424	Environmental Geotechnics	3	0	0	3
		Transportation Engineering				
1	CE 432	Railway and Airport Engineering	3	0	0	3
2	CE 406	Advanced Pavement Materials and Construction	3	0	0	3
3	CE 417	Advanced Traffic Engineering and Highway Design	3	0	0	3
4	CE 419	Advanced Pavement Design and Management	3	0	0	3
5	CE 427	Urban Transportation Planning	3	0	0	3
6	CE 430	Sustainable Practices in Highway and Pavement Engineering	3	0	0	3
		Water Resources and Environmental Engineering				
1	CE 420	Remote Sensing and GIS	3	0	2	4
2	CE 421	Design and Drawing of Irrigation structures	3	0	0	3
3	CE 422	Air Pollution: Measuring & Mitigation	3	0	0	3
4	CE 423	Reservoirs & Dam Engineering	3	0	0	3
5	CE 426	Environmental System Management	3	0	0	3
6	CE 431	Computer Methods in Civil Engineering	3	0	0	3

LIST OF TECHNICAL ELECTIVES

Course Code	Course Name	L	T	P	C
CE 402	Advanced Environmental Engineering	3	0	0	3
CE 403	Advanced Pavement Engineering	3	0	0	3
CE 404	Introduction to Structural Dynamics	3	0	0	3
CE 405	Advanced Reinforced concrete design	3	0	0	3
CE 406	Advanced Pavement Materials and Construction	3	0	0	3
CE 407	Advanced Structural Analysis	3	0	0	3
CE 408	Construction Materials	3	0	2	4
CE 409	Sustainable Construction Methods	3	0	0	3
CE 410	Green Buildings	3	0	0	3
CE 411	Prestressed Concrete	3	0	0	3
CE 412	Finite Element Methods	3	0	0	3
CE 413	Bridge Engineering	3	0	0	3
CE 414	Advanced Foundation Engineering	3	0	0	3
CE 415	Ground Improvement Techniques	3	0	0	3
CE 416	Designing with Geosynthetics	3	0	0	3
CE 417	Advanced Traffic Engineering and Highway Design	3	0	0	3
CE 418	Traffic Safety	3	0	0	3
CE 419	Advanced Pavement Design and Management	3	0	0	3
CE 420	Remote Sensing and GIS	3	0	0	3
CE 421	Design and Drawing of Irrigation structures	3	0	2	4
CE 422	Air Pollution: Measuring & Mitigation	3	0	0	3
CE 423	Reservoirs & Dam Engineering	3	0	0	3
CE 424	Environmental Geotechnics	3	0	0	3
CE 425	Earth Retaining structures	3	0	0	3
CE 426	Environmental System Management	3	0	0	3
CE 427	Urban Transportation Planning	3	0	0	3
CE 428	Soil Dynamics	3	0	0	3
CE 429	Analysis and Design of Masonry Structures	3	0	0	3
CE 430	Sustainable Practices in Highway and Pavement Engineering	3	0	0	3
CE 431	Computer Methods in Civil Engineering	3	0	0	3
CE 432	Railway and Airport Engineering	3	0	0	3

SEMESTER-I

SEMESTER-I

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
EGL 101	Communicative English	HS	3	0	0	3

UNIT I: RHETORIC AND PUBLIC SPEAKING
Rhetoric, Critical thinking and public speaking, thinking outside the box, how to deliver a speech, Fundamentals of persuasion.

UNIT II: NON-VERBAL COMMUNICATION
Nonverbal communication, Spatial distance, Eye contact and appearances, Eye contact and appearances.

UNIT III: COMMUNICATION AND THE MEDIA
Persuasion and the media, Radio, television, film, Social media and the internet, How the media sells the ideas, images, products, Informative/scientific speeches and research, Heart of the speech, powerful narratives, Power of narrative.

UNIT IV: SMALL GROUP COMMUNICATION
Leadership, conflict and persuasion in group, Leadership, conflict and persuasion in group, Moment of Inertia by analytical method, Group problem solving, learning to say no.

TEXTBOOKS
1. Communication: Principles for a Lifetime. Beebe, Beebe and Ivy, Sixth Edition, Pearson Publishing.

REFERENCE BOOKS/OTHER READING MATERIAL
2. Qualitative Communication Research Methods (2011) Bryan C. Taylor and Thomas R. Lindlof. Sage Publications, New Delhi, India, 3rd Edition
3. The Fundamentals of Small Group Communication (2008) Scott A. Myers and Carolyn M. Anderson. Sage Publications, New Delhi, India.

SEMESTER-I

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
PHY 101	Engineering Physics	BS	3	0	0	3

UNIT I: CLASSICAL MECHANICS
Vector calculus and Kinematics, Dynamics: Contact forces, Static friction, kinetic friction and worked examples, Free body force diagram; Applications of Newton's law. Worked examples (i.e., pulley, inclined planes), Momentum and Impulse, Conservation of linear momentum, Calculation of Centre of mass for complex systems, Work and Kinetic Energy Theorem, Motion at inclined plane, Conservation of mechanical energy: Worked out problems, Rotational motion: MoI, Torque, Angular momentum, and Conservation of Angular Momentum, Newtons Laws of Universal Gravitation. Kepler's Law & Planetary motion.

UNIT II: WAVES, OSCILLATIONS AND OPTICS
Simple harmonic motion: position, velocity, and acceleration, Circular Analogy of SHM and Simple Pendulum, Compound Pendulum and Torsional Pendulum, Damped harmonic oscillations, Forced harmonic oscillations, Quality factor, Bandwidth & Resonance, Longitudinal & Transverse Wave, Traveling and Standing Wave, Concept of Electromagnetic waves – Geometrical & Physical Optics, Conditions of Interference: Young's Double Slit Experiment, Introduction to Diffraction Patterns: Fresnel and Fraunhofer Diffraction.

UNIT III: THERMODYNAMICS
Zeroth law of thermodynamics and concept of temperature, Types of Thermometers and temperature scales: inter - relation among temperature scales, Introduction of Heat and Internal energy, Calorimetry and Concept of Specific Heat, Concept of Work and inter -relation among Heat, Work, and IE: First Law of Thermodynamics, Application of 1st law of thermodynamics & introduction of thermodynamic processes – adiabatic, isothermal etc, Second law of thermodynamics: Heat Pump and Heat Engines, Concept of Entropy: Reversible and Irreversible Process, Thermodynamic Phases and phase transitions: Concept of Latent Heat.

UNIT IV: ELECTRO-MAGNETISM-I
Describe Maxwell Equations as the foundation of electro - magnetism. Derive differential forms starting from Integral forms. Discuss Physical Significance, Focus on Maxwell's Equation I: Discuss lines of force and Electrostatic flux, Introduce Gauss's law (differential and integral form), Application of Gauss Law: ES field due to infinite wire and sheet, Electrostatic field due to conducting and insulating sphere & cylinder, Discuss Coulomb's Law as an alternative & direct approach to calculate electrostatic field – superposition principle, electrostatic field due to discrete charges, Concept of Electrostatic Potential and Potential Energy. Inter -relation with electrostatic field, Capacitor and Capacitance: Capacitance of a parallel plate capacitor, Electric dipole and dipole moment, Electric potential, and electrostatic field due to a physical dipole, Definition and inter-relation of Polarization P, Electric displacement D, Electric susceptibility, and relative permittivity.

UNIT 5: ELECTRO-MAGNETISM - II

Focus on Maxwell's Equation II: Discuss absence of Magnetic monopoles! Introduce Magnetic Vector potential using vector calculus, Focus on Maxwell's Equation IV: Discuss Ampere's circuital law. Calculate Magnetic field due to Infinite wire and Solenoid using Ampere's Law, Introduce Biot-Savart Law as an alternative approach to calculate magnetic field. Calculate Magnetic field due to finite current element using Biot Savart Law, Derive force between parallel current - define 1 Ampere using magnetic force, Calculate magnetic field due to circular loop using Biot Savart Law, Focus on Maxwell's Equation III: Lenz's Law and Faraday's law: Induced EMF and Current, Definition and inter-relation between Magnetic field, magnetic moment, magnetization, magnetic induction, magnetic susceptibility, and permeability, Discuss classification of Magnetic materials, Ferromagnetic materials, Hysteresis loss, B-H curve.

TEXTBOOKS/REFERENCE BOOKS

1. University Physics with Modern Physics with Mastering Physics - D Young, Roger A Freedman And Lewis Ford,   XII Edition (2018), Publisher – PEARSON
2. Physics for Scientist and Engineers - Raymond A. Serway, John W. Jewett, XIX Edition (2017), Publisher - Cengage India Private Limited
3. Concept of Modern Physics - Arthur Beiser, Shobhit Mahajan, S Rai, 2017 Edition, Publisher - Tata McGraw Hill
4. Introduction to Electrodynamics – David J. Griffiths; 4th Edition (2012), Publisher - PHI Eastern Economy Editions.
5. Electricity and Magnetism - A S Mahajan and A A Rangwala, Revised of 1 Edition (2001), Publisher - McGraw-Hill.
6. Advanced Engineering Mathematics   - Erwin Kreyszig, X Edition (2016), Publisher - Wiley.

SEMESTER-I

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
PHY 101 L	Engineering Physics Lab	BS	0	0	2	1

LIST OF EXPERIMENTS
1a. Revisions of Vernier caliper and Screw Gauge measurement methods.
1b. Plotting experimental data in graphs and error analysis.
2. To determine the moment of inertia of a flywheel
3.(a) Measurement of time period for a given compound
pendulum with different lengths.
(b) To determine radius of gyration of a given pendulum.
4. Verification of Stefan`s Law.
5. Measurement of specific heat capacity of any given material.
6. Verify of Hooke's law and to determine spring contact for given spring combinations.
7. To determine the rigidity modulus of steel wire by torsional oscillations.
8. To calculate Young's modulus of a given material by deflection method.
9. a) To measure the capacitance as a function of area and distance between the plates.
b) To determine the dielectric constant of different dielectric materials.
10. (a) Measurement of the induced voltage impulse as a function of the velocity of the magnet.
   b) Calculation of the magnetic flux induced by a falling magnet as a function of the velocity of the magnet.
11. a) To study the magnetic field along the axis of a current carrying circular loop.
b) To study the dependency of magnetic field on the diameter of coil.
12. (a) To investigate the spatial distribution of magnetic field between coils and determine the spacing for uniform magnetic field.
b) To demonstrate the superposition of the magnetic fields of the two individual coils.
Study of B-H-Curve
13. To study permeability curve of a given material

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Physics for Scientist and Engineers, Ninth edition (2017) - Raymond A. Serway, John W. Jewett (Publisher - Cengage India Private Limited)).
2. Physics laboratory manuals.

SEMESTER-I

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CHE 103	Chemistry for Engineers	BS	2	0	0	2

UNIT I: CHEMICAL BONDING

Ionic, covalent, and metallic bonds. Theories of bonding: Valence bond theory, Nature of covalent bond, sigma (σ) bond, Pi(π) bond, Hybridization: Types of hybridizations, sp2, sp3, sp3d, d2sp3, Shapes of molecules (VSEPR Theory):$BeCl_2,CO_2,BF_3,H_2O,NH_3$, $CH_4,PCl_5,XeF_2,SF_6,XeF_4$, Molecular orbital theory: Linear combination of atomic orbitals (LCAO Method), Bond order, homo(H_2,O_2,N_2) and hetero nuclear diatomic molecules(NO,CO), Non-covalent interactions: Vander Waals interactions, Dipole-ipole interactions, and hydrogen bonding.

UNIT II: PHASE RULE AND KINETICS

Phase rule: Introduction, Definition of the terms used in phase rule with examples, Application of phase rule to water system, Sulphur system and lead-silver system, Kinetics: Order and molecularity of reactions, zero order, first order and second order reactions.

UNIT III: WATER TECHNOLOGY

Standards for drinking water, Methods of Treatment of water for domestic and industrial purposes: Sedimentation, Coagulation, Filtration, Sterilization. Break point chlorination, Determination of Hardness of water by EDTA method. Demineralization of water, Softening of water: Lime-soda Process, Ion exchange process, Zeolite process, Boiler Troubles: Priming, Foaming, Scale. Sludge, Corrosion, Caustic Embrittlement.

UNIT IV: POLYMER CHEMISTRY

Classification of polymers: Natural and synthetic, Thermoplastic and Thermosetting. Degree of polymerization, Types and mechanism of polymerization: Addition (Free Radical, cationic and anionic), Condensation and copolymerization. Properties of polymers: Tg, Tactility, Molecular weight average, number average and poly dispersity index, Molecular weight average, number average and poly dispersity index.

UNIT V: ELECTROCHEMISTRY

Arrhenius theory of electrolytic dissociation. Classification of electrolytes; degree of Dissociation of acids, Dissociation constant of weak acids. Concept of Ph and pOH, buffer solutions, Solubility product, common ion effect indicators and theory of acid base indicator, Conductance of solutions-specific, molar and equivalent conductance, Variation of molar conductance with dilution for strong and weak electrolytes, Migration of ions-Kohlrausch's law of independent migration of ions. Ostwald's dilution law; Nernst equation for single electrode and electrochemical cells.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL

A. Bahl and B. S. Bahl, G. D. Tuli, Essentials of physical chemistry, S Chand Publication,2014, ISBN: 8121929784.P.W. Atkins, T.L. Overton, J.P. Rourke, M.T. Weller and F.A. Armstrong Shriver andAtkins' Inorganic Chemistry, 5th Ed., Oxford University Press, London, 2010, ISBN 978-1-42-921820-7

B. Atkins, P.W.; de Paula, J. Physical chemistry, 8th ed., 2006 Oxford University Press. ISBN0-19-870072-5

C. B. R. Puri, L. R. Sharma & M. S. Pathania, Principles of Physical Chemistry, 46th Ed.,2013, Vishal   Publication Company
D. F.W. Billmeyer, Text Book of Polymer Science, 3rd Ed., John Wiley & Sons, New York,2003.
E. J. Bard and L.R. Faulkner, Electrochemical methods –Fundamentals and applications, 2nd Ed., John Wiley and Sons, 2001.
F. Jain P.C. & Monika Jain, Engineering Chemistry, Dhanpat Roy & Sons, 2015.

SEMESTER-I

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CHE 103 L	Chemistry for Engineers Lab	BS	0	0	2	1

LIST OF PRACTICAL EXPERIMENTS
1. Volumetric titration of HCl vs NaOH.
2. Conductometric titration of HCl vs NaOH.
3. Standardization of potassium permanganate by Oxalic acid.
4. Iodometric Determination of Ascorbic Acid (Vitamin C)
5. Determination of hardness of water by EDTA method.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Estimation of iron content of the given solution using potentiometer.
8. Determination of sodium and potassium by flame photometry.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ENV 111	Environmental Science	BS	2	0	0	2

UNIT I: ENVIRONMENTAL CRISIS AND SUSTAINABLE DEVELOPMENT

Need for environmental science studies Fundamentals of ENV – Atmosphere, lithosphere, hydrosphere, biosphere. Global environmental crisis and its causes, Man-Environment relationship & Interaction, Ecological footprint, Sustainable development.

UNIT II: ECOSYSTEMS

Ecosystem - Structure and functions of an ecosystem, Energy flow in an ecosystem, biomass flow in an ecosystem, food chain and web Ecological Succession, Ecological pyramid, Water cycle, Carbon cycle, Sulphur cycle, Nitrogen cycle, Forest ecosystems: tropical rain forest, coniferous forests, tundra forests, temperate forests, Grasslands and desert ecosystems, Aquatic ecosystems: Freshwater zones, streams, rivers, state of rivers in India, wetlands, Zones in ocean, ocean activities, coastal zones, Estuaries, Mangroves.

UNIT III: RENEWABLE AND NON-RENEWABLE RESOURCES

Energy resources: Global energy crisis, energy sources, energy needs, global energy consumption, Renewable and Non-renewable energy sources: Hydropower, Solar, tidal, wind, energy, Bioenergy, coal, natural gas, Energy resources: fossil fuel vs renewable fuels, peak oil, conventional and unconventional oil, oil price determination, Environmental implications of Energy use: India and world, Energy use pattern – national and global, Water availability, Water for irrigation, water situation in India.

UNIT IV: BIODIVERSITY

Significance of biodiversity, Current state of biodiversity: National and global, Causes of biodiversity loss, Biological hotspots, aquatic biodiversity, Endangered species and endemic species of India, Biodiversity conservation: Seed banks, botanical gardens, marine biodiversity protection, national and international efforts.

UNIT V: ENVIRONMENTAL POLLUTION AND CONTROL

Types of Environmental Pollution Air pollution: Sources, effects, and control Air standards Air pollution in India and the world Sources of air pollution Outdoor & Indoor air pollution Point source, mobile, area source.
Effects of air pollution:
Smog, urban heat island, ozone layer depletion, acid rain.
Controlling air pollution:
Emission regulation, e-cars
Water pollution: Sources & effects Water Quality standards Water pollutants, eutrophication, thermal pollution, bio-magnification Wastewater treatment, Methods of water purification.
Soil pollution: Sources, causes and effects Control of soil pollution: Air purging, phytoremediation, and bio-remediation.
Solid waste management, Types and sources of solid wastes, Hazardous waste, and electronic wastes, Recycling, and management of solid wastes (4Rs), Sanitary landfills and leachate management.

Noise pollution: Sources, effects, and control Air quality standards with respect to noise.
Introduction to Climate change: Impact of climate change, IPCC assessment, Carbon footprint, carbon sequestration, carbon trade, carbon credits, Kyoto protocol, Montreal protocol, Paris agreement. COVID-19: Environmental aspects.

TEXTBOOKS / REFERENCE BOOKS / OTHER READING MATERIAL:

1. R. Rajagopalan (2016). Environmental Studies (3rd edition), Oxford University Press.
2. Deeksha Dave, S.S. Katewa (2012). Textbook of Environmental Studies (2nd edition), Cengage.
3. W. Cunningham, M. Cunningham (2016). Principles of Environmental Science (8th Edition), McGraw-Hill.
4. KL Rao (1979). India's water wealth. Orient Black Swan.
5. Saadat, S., Rawtani, D., & Hussain, C. M. (2020). Environmental perspective of COVID-19. Science of The Total Environment, 138870.

SEMESTER-I

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ENV 111 L	Environmental Science Lab	BS	0	0	2	1

WATER QUALITY
1. Turbidity and pH of water.
2. Total suspended solids and total dissolved solids.
3. Measurement of Alkalinity & Acidity.
4. Dissolved oxygen measurement Using Winkler Method & Biochemical Oxygen Demand.
5. Hardness of Water.
6. Iron concentration in water
7. Determination of Chemical Oxygen Demand.

AIR QUALITY
8. Measurement of noise at different sources using Sound Level Meter.
9. Monitoring and analysis of Particulate Matter PM_{10} in ambient air.
10. Monitoring and analysis of Particulate Matter $PM_{2.5}$ in ambient air.
11. Sampling and analysis of Nitrogen dioxide in ambient air.

SOLID WASTE MANAGEMENT
12. Physical characteristics of Solid wastes – Biodegradable and non-degradable wastes.
13. Determination of Moisture Content (MC), Total Solids (TS), Total Volatile Solids (TVS) and Ash Content (AC) in solid waste.

ENERGY RESOURCES
14. Saltwater fuel cell

TEXTBOOKS / REFERENCE BOOKS / OTHER READING MATERIAL
1. APHA and AWWA (2017): Standard Methods for the Examination of Water and Wastewater. American Public Health Association (APHA), 23rd Ed, Washington, D.C., USA.
2. Grasshoff, K., Kremling, K., & Ehrhardt, M. (Eds.). (2009). Methods of seawater analysis. John Wiley & Sons.
3. IS 5182 (Part 23): 2006. https://law.resource.org/pub/in/bis/S02/is.5182.23.2006.pdf
4. IS:10158-1982 Indian Standard Methods of Analysis of Solid Wastes https://law.resource.org/pub/in/bis/S02/is.10158.1982.html.
5. Park, S., SenthilKumar, B., Kim, K., Hwang, S. M., & Kim, Y. (2016). Saltwater as the energy source for low-cost, safe rechargeable batteries. Journal of Materials Chemistry A, 4(19), 7207-7213.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
MAT 112	Single Variable Calculus	BS	3	0	0	3

UNIT I: SEQUENCES AND SERIES
Sequences, series, Sum of a series, Geometric series, p-series, Comparison test, root test, ratio test.

UNIT II: LIMITS AND CONTINUITY
Limit of a function at a point, one sided limits, Continuity, Limits involving infinity.

UNIT III: DIFFERENTIATION
Derivative at a point, Derivative as a function, Product Rule, Quotient Rule, Chain Rule, Implicit Differentiation, Rolle's Theorem, Mean Value Theorem.

UNIT IV: APPLICATIONS OF DERIVATIVES
Maxima and minima, Monotonic functions and first derivative test, Related rates, Concavity and curve sketching, Optimization problems, Newton's Method, Taylor and MacLaurin Series.

UNIT V: INTEGRATION
Area as a limit of finite sums, Definite and indefinite integral, Fundamental Theorem of Calculus, Integration by substitution and integration by parts, Area between curves, Arc length.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Thomas' Calculus, 14th Edition, (2018) – J. Hass, C. Heil, M. Weir, Pearson Education.
2. Introduction to Real Analysis, Fourth Edition (2014) – R. Bartle, D. Sherbert, John Wiley and Sons.
3. Calculus and Analytic Geometry, Ninth Edition (2017) – G. Thomas, R. Finney, Addison Wesley.

SEMESTER-I

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CSE 105	Introduction to Programming Using C	ES	3	0	0	3

UNIT I: INTRODUCTION
1. Computer systems, hardware and software. Problem solving: Algorithm / Pseudo code, flowchart, program development steps.
2. Computer languages: Machine, symbolic and high-level languages.
3. Creating and Running Programs: Writing, editing (any editor), compiling (gcc), linking and executing in Linux environment.
4. Structure of a C program, identifiers.
5. Basic data types and sizes. Constants, Variables.
6. Arithmetic, relational and logical operators, increment and decrement operators.
7. Conditional operator, assignment operator, expressions.
8. Type conversions, Conditional Expressions.
9. Precedence and order of evaluation, Sample Programs.

UNIT II
10. **SELECTION & DECISION MAKING:** if-else, null else, nested if, examples.
11. Multi-way selection: switch, else-if, examples.
12. **ITERATION:** Loops - while, do-while and for, break, continue
13. Initialization and updating, event and counter controlled loops and examples.
14. **ARRAYS:** Concepts, declaration, definition, storing and accessing elements.
15. One dimensional, two dimensional and multidimensional arrays.
16. Array operations and examples.
17. Character arrays.
18. String manipulations.

UNIT III: MODULAR PROGRAMMING:
19. Functions – Basics.
20. Parameter passing.
21. Storage classes extern, auto, register, static, scope rules.
22. User defined functions, standard library functions.
23. Passing 1-D arrays, 2-D arrays to functions.
24. Recursive functions - Recursive solutions for Fibonacci series.
25. Towers of Hanoi.
26. C Pre-processor.
27. Header files.

UNIT IV: POINTERS

28. Concepts, initialization of pointer variables.
29. Pointers as function arguments, passing by address.
30. Dangling memory, address arithmetic.
31. Dangling memory, address arithmetic.
32. Pointers to pointers.
33. Pointers and multi-dimensional arrays.
34. Dynamic memory management functions.
35. Command line arguments.
36. Command line arguments.

UNIT V

37. Structures - Declaration, definition and initialization of structures, accessing structures.
38. Nested structures, arrays of structures.
39. Structures and functions, pointers to structures, self-referential structures.
40. Unions.
41. Typeset, bit-fields.
42. Program applications.
43. Bit-wise operators: logical, shift, rotation, masks.
44. **FILE HANDLING**: Concept of a file, text files and binary files, formatted I/O.
45. I/O operations and example programs.

TEXTBOOKS/REFERENCE BOOKS/OTHER READING MATERIAL

1. The C programming Language by Dennis Richie and Brian Kernighan
2. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PEARSON
3. Programming in C, Second Edition Pradip Dey and Manas Ghosh, OXFORD Higher Education.
4. Programming in C, A practical approach Ajay Mittal PEARSON.
5. Programming in C, B. L. Juneja, Anith Seth, Cengage Learning.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CSE 105 L	Introduction to Programming Using C Lab	ES	0	0	2	1

LIST OF SESSIONS
1.　　　Basic C programs
　　　　a. Calculation of the area of triangle.
　　　　b. Find the largest of three numbers using ternary operator.
　　　　c. Swap two numbers without using a temporary variable.
　　　　d. Find the roots of a quadratic equation.
　　　　e. Takes two integer operands and one operator form the user, performs the operation and then prints the result.

2.　a.　Find the sum of individual digits of a positive integer and find the reverse of the given number.
　　　b. Generate the first n terms of Fibonacci sequence.
　　　c. Generate all the prime numbers between 1 and n, where n is a value supplied by the user.
　　　d. Print the multiplication table of a given number n up to a given value, where n is entered by the user.
　　　e. Decimal number to binary conversion.
　　　f. Check whether the given number is Armstrong number or not.

3. a. Interchange the largest and smallest numbers in the array.
　　b. Sorting array elements.
　　c. Addition and multiplication of 2 matrices.

4.　a.　Function to find both the largest and smallest number of an array of integers.

　　b. Liner search.

　　c. Replace a character of string either from beginning or ending or at a specified location.

5.　a. Reading a complex number.

　　b. Writing a complex number.

　　c. Addition of two complex numbers.

　　d. Multiplication of two complex numbers.

　6.　a. Concatenate two strings.

　　　b. Append a string to another string.

　　　c. Compare two strings.

　　　d.　Length of a string.

e. Find whether a given string is palindrome or not.

7. a. Illustrate call by value and call by reference.

b. Reverse a string using pointers.

c. Compare two arrays using pointers.

8. a. To find the factorial of a given integer.

b. To find the GCD (greatest common divisor) of two given integers.

c. Towers of Hanoi.

9. File Operations (File copy, Word, line and character count in a file).

10. Command line arguments (Merge two files using command line arguments).

SEMESTER-I

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ISES 101	Industry Specific Employability Skills- I	HS	1	1	0	1

UNIT I: QUANTS
Speed calculations, Time and Distance, Problems on Trains, Boats and Streams, Races And Games, Escalator Problems, Time and Work , Chain Rule, Pipes and cistern, Simplification , surds and indices, Square roots and cube roots, Functions.

UNIT II: REASONING
Number Series, Alphabet series, Odd Man Out, Missing number, Wrong number, Analogies, Mathematical Operations, Calendars, Clocks, Cryptarithmetic, Identification of Cross-Variable Relation, Sudoku.

UNIT III: VERBAL
Basic sentence structure: Nouns, Pronouns, Adjectives, Parts of speech, Degree of comparison, Articles, conditionals and sentences (kinds), Verb tense, Sentence formation, Paragraph formation, Change of voice, Change of speech, Synonyms, Antonyms.

UNIT IV: COMMUNICATION SKILLS
Self-Introduction, Presentations, Email Etiquette.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Mitchell S. Green – 2017, Know Thyself: The Value and Limits of Self-Knowledge.
2. Debbie Hindle, Marta Vaciago Smith - 2013 , Personality Development: A Psychoanalytic Perspective.
3. Lani Arredondo - 2000, Communicating Effectively.
4. Patsy McCarthy, Caroline Hatcher - 2002, Presentation Skills: The Essential Guide for Students.
5. Martha Davis, Elizabeth Robbins Eshelman, Matthew McKay - 2008, Time Management and Goal Setting: The Relaxation and Stress.
6. Arun Sharma – How to prepare for Quantitative Aptitude, Tata Mcgraw Hill.
7. RsAgarwal, A Modern Approach to Verbal and Non Verbal Reasoning,S.Chand Publications.
8. Verbal Ability and Reading comprehension-Sharma and Upadhyay.
9. Charles Harrington Elstor, Verbal Advantage: Ten Easy Steps to a Powerful Vocabulary, Large Print, September 2000.
10. GRE Word List 3861 – GRE Words for High Verbal Score, 2016 Edition.
11. The Official Guide to the GRE-General Revised Test, 2nd Edition, Mc Graw Hill Publication.
12. English Grammer and composition – S.C. Gupta.R.S. Agarwal – Reasoning.
13. Reasoning for competitive exams – Agarwal.

SEMESTER-II

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ENG 115	Engineering Mechanics	ES	3	0	0	3

UNIT I: STATICS OF PARTICLES AND RIGID BODIES
Forces on particles, Resolution of forces, Free body diagrams, Equilibrium of particles, Equilibrium of particles (Numerical Problems), Forces in a plane, Forces in space, Forces in space (Numerical Problems), Forces in space (Numerical Problems), Force equivalence, Force equivalence (Numerical Problems), Rigid body equilibrium, Rigid body equilibrium (Numerical Problems), Rigid body equilibrium (Numerical blems).

UNIT II: FRICTION
Laws of friction, dry friction, Wedge friction, rolling friction, Belt friction, Belt friction, Screw friction.

UNIT III: ANALYSIS OF TRUSSES AND CENTROIDS
Types of loads, type of supports, reaction, Simple trusses, method of joints, Method of joints, Method of sections (Numerical Problems), Method of Joints (Numerical Problems), Method of Joints (Numerical Problems), Center of gravity-lines, areas, Volumes, Determination of centroid-integration Method, Determination of centroid-integration method (Numerical Problems).

UNIT IV: MOMENT OF INERTIAS OF SURFACE AND VOLUMES
Determination of moment of inertia using area integration method, Determination of moment of inertia using area integration method, Determination of moment of inertia using area integration method, Analytical method, radius of gyration, Polar moment of inertia, Moment of inertia of different sections.

UNIT V: DYNAMICS
Rectilinear motion, Projectile motion, Newtons second law of motion, Alembert's principle , Work, energy, Impulse momentum, Impact/collision of elastic bodies, Oblique impact, Curvilinear motion.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Ferdinand. P. Beer. E, Russell Johnston Jr., David Mazurek, Philip J Cornwell, Vector Mechanics for Engineers: Statics and Dynamics, McGraw - Hill, New Delhi, 10th Edition, 2013.
2. R.K. Bansal, Engineering Mechanics, Laxmi Publications Ltd, 2005.
3. Meriam J.L and Kraige L.G., Engineering Mechanics, Volume I - statics, Volume II - dynamics, John Wiley & Sons, New York,7th Edition, 2012.
4. Timoshenko, Young, Engineering Mechanics, Tata Mc-Graw Hill Book Company, 5th Edition, New Delhi.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CSE 107	Data Structures	ES	3	0	0	3

UNIT I: INTRODUCTION TO DATA STRUCTURES

Introduction to data structures, Abstract Data Type (ADT) representation and implementation, Time and space requirements of algorithms, Array ADT, representing polynomials, Sparse matrices using arrays and their operations, Implementation of double linked list various operation using C, Stacks and Queues: Representation and application, implementation of stack and queue operations using C.

UNIT II: LINKED LISTS

Single linked lists, Implementation of link list, various operation using C, double linked list, circular list and applications.

UNIT III: TREES

Tree terminology, Binary tree, Binary search tree, Infix to Post fix conversion, Postfix expression evaluation, AVL Tree, Complete Binary Tree representation.

UNIT IV: GRAPHS

Graph terminology, Representation of graphs, Path matrix, BFS (breadth first search), Implementation of BFS using C, DFS (depth first search), Implementation of DFS using C, Topological sorting, Shortest path algorithms, Priority Queues : Heap Structures, binomial heaps, leftist heaps.

UNIT V: SORTING AND SEARCHING TECHNIQUES

Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort and Implementation, Linear and binary search methods, implementation.

TEXT BOOKS /REFERENCE BOOKS /OTHER READING MATERIAL

1. "Data Structure -- A Pseudo code approach with C" by Richard R. Gilberg & Behrouz A. Forouzan, 2nd edition, 2011. Cengage Learning. Imprint: Thomson Press (India) Ltd.
2. Data Structures Using C" by Aaron M. Tanenbaum, Yedidvah Langsam, and Moshe J. Augenstein. Pearson Publishers, 2019.
3. Data structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson publications, Second Edition Programming in C. P. Dey and M Ghosh, Second Edition, Oxford University Press.
4. Fundamentals of data structure in C" by Horowitz, Sahani & Anderson Freed, Computer Science Press
5. G. A. V. Pai: "Data Structures & Algorithms; Concepts, Techniques & Algorithms" Tata McGraw Hill.

SEMESTER-II

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CSE 107 L	Data Structures Lab	ES	0	0	2	1

Week 1 & 2:

Simulate the following operations

a. Conversion of infix expression to postfix expression.

b. Evaluation of expressions.

c.   Assignment-1: Tower of Hanoi is a mathematical puzzle where we have three rods and n disks. The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules:

i.   Only one disk can be moved at a time.

ii.   Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack i.e. a disk can only be moved if it is the uppermost disk on a stack.

iii.   No disk may be placed on top of a smaller disk

iv.   You can choose to use the function move (4, 1, 3, 2), where 4 represents the number of disks. 1 represents disks on source shaft, 3 represents the destination shaft which holds the disks after the move and finally 2 represents the intermediate support shaft – temporary storage. Write a C program to simulate the given problem and: Perform the algorithmic complexity analysis for the solution you propose.

Week 3 & 4:

Simulate the following tasks:

a. Implementation of the following operations: enqueue, dequeue and finding an element.

i. Linear Queue using arrays.

ii. Circular queue arrays.

iii. Priority queue singly linked list.

b. Assignment-2: The "4-Queens Problem" consists of placing four queens on a 4 x 4 chessboard so that no two queens can capture each other. That is, no two queens are allowed to be placed on the same row, the same column, or the same diagonal (both primary and secondary diagonals). Write a C program to simulate the given problem and perform the algorithmic complexity analysis for the solution you propose.

Week 5 & 6:

Demonstrate the following though simulation:

a.   Create a singly linked list and perform the following operations:

i.   Add an element at the end of the list

ii.   Delete an element from the beginning of the list

iii.   Find the middle element of the list

iv.   Search the given key form the list

v.   Polynomial addition using linked list

vi.   Sparse matrix operations using linked list

b.   Assignment-3: Let us consider a small but busy airport with only one run-way (shown in figure). In each time unit, one plane can land or one plane can take off, but not both. Planes arrive ready to land or to take off at random times, so at any given unit of time, the runway may be idle or a plan may be landing or taking off, and there may be several planes waiting

either to land or take off. We therefore need two queues, called landing and takeoff, to hold these planes. It is better to keep a plane waiting on the ground than in the air, so a small airport allows a plane to take off only if there are no planes waiting to land. Hence, after receiving requests from new planes to land or take off, our simulation will first service the head of the queue of planes waiting to land, and only if the landing queue is empty will it allow a plane to take off. We shall wish to run the simulation through many units of time, and therefore, we embed the main action of the program in a loop that runs for cur-time (denoting current time) from 1 to a variable end-time. Simulate the given scenario using and write the output for different inputs.

Week 7 & 8:

Write code to perform the following operations:

a. Develop a code to test whether the given tree is binary tree or not.

b. Implementation of Binary tree traversals techniques – pre-order, in-order, and post-order.

c. Implementation of AVL tree and its operations.

d. Assignment-4: Given a mathematical expression, evaluate it using appropriate tree structure.

Week 9 & 10:

Write the codes to perform the following tasks

A Implementation of Graph traversals techniques: i) BFS and ii) DFS.

b. Assignment-5: The Dijkstra's algorithm is an algorithm that gives the shortest path between two given vertices of a graph. In this problem we are given a directed graph with each edge having a non-negative weight. Thus, a solution requires a path of many other that costs least. We can think of the problem as like this: think graph G as a map of the airline routes, each node of the graph as the cities and the weights on each edge as the cost of flying from one city to another city. The solution we have to find a routing from a city v to city w such that the total cost is minimum.

Write a C program to simulate the given problem. That is find the shortest path between node A and node F in the given graph.

Week 11 & 12:

Implementation of the following algorithms:

a. Linear search.

b. Binary search.

c. Implementation of Bubble sort algorithm.

d. Implementation of Selection sort algorithm.

e. Implementations of Merge sort algorithm.

Week 13 & 14:

a. Implementation of Insertion sort algorithm.

b. Implementation of quick sort algorithm.

c. Assignment-6: Suppose you work at college library. You are in the middle of a quiet afternoon when suddenly a shipment of 3928 different books arrives. The books have been dropped of in one long straight line, but they are all out of order, and the automatic sorting system is broken. To make matter worse, classes will start tomorrow, which means that first thing in the morning, students will show up in droves looking for these books. How can you get them all sorted in time.?

Simulate the given scenario using C code. Perform the algorithmic time complexity analysis

for the solution you propose. Also give the space complexity.

Week 15:

Our Text editor will allow us to read a file into memory i.e., it is stored in the buffer. We consider each line of text to be a string and buffer will be a list of these lines. we shall then devise editing commands that will do list operations on lines in buffer and will do string operations on characters in a single line. Here are few commands;
a.   R – Read the text file
b.   W – Write to text file
c.   I – Insert a new line
d.   D – Delete the current line
e.   P – Previous line (back up one line in buffer)
f.   B – Go to first line of buffer
g.   E – Go to last line of buffer
h.   Q – Quit the editor
Tasks we do are:
a)   Receiving a command from user
b)   Get Command () – this function gets the command from user
c)   Do Command () – this function performs the command
Now we have to perform the command for example if the command is 'b' we have to go beginning of buffer; if it is 'n' we must move to next line. All these commands can be performed using switch case statement. Using the switch case statements, we check for the command and specify the functions to perform the appropriate task.
Reading and Writing Files:
a. Reads the file contents of input file into buffer stopping at the end of file. Here we use some functions List Empty (), Clear List (), Create List (), Insert List (), see the code in the book for better understanding.
b. Searching for a String: Here we search for a string from user and informs the user if the target is found or not.
c. Changing one string to another: Here we change the string that the user wants to replace from the existing string. If the string is not found user will be informed that string is not found. If found, we should replace the old string with the new string.
Perform the algorithmic complexity analysis for the solution you propose.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. https://www.youtube.com/watch?v=YstLjLCGmgg
2. Data Structures and Program Design in C by Robert Kruse, C L Tondo, Bruce Leung and Shashi Mogalla. For pseudocode, refer the following pages 98 to 105.
3. Online Reference: https://www.youtube.com/watch?v=xFv_Hl4B83A
4. Data Structures and Program Design in C by Robert Kruse, C L Tondo, Bruce Leung and Shashi Mogalla. For pseudocode, refer the following pages 139 to 150
5. Data Structures and Program Design in C by Robert Kruse, C L Tondo, Bruce Leung and Shashi Mogalla. For pseudocode, refer the following pages 510 to 514
6. Data Structures and Program Design in C by Robert Kruse, C. L. Tondo , Bruce Leung and Shashi Mogalla. For pseudocode, refer the following pages 302 to 312.

Online resources: Use the following link to get a better understanding on the problem.
https://www.youtube.com/watch?v=PgBzjlCcFvc

NOTE: -
1. The assignments can be performed in groups (not more than 4 in a group).
2. Deliverables: A report containing the following
   a. Title of the problem/program
   b. Problem statement and Objective(s) of the problem
   c. Working code, without errors.
   d. Output written for different input cases.
   e. Conclusion: Algorithmic complexity and the problem you faced during the learning to execution stage.

SEMESTER-II

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
MAT 121	Multi Variable Calculus	BS	3	0	0	3

UNIT-I: VECTORS AND MATRICES
Three-dimensional coordinate system, Vectors, Dot products, Vector products, Lines and planes

UNIT-II: PARTIAL DERIVATIVES
Functions of several variables, Limits and continuity for several variable functions, Partial derivatives, The chain rule, Directional derivatives, Gradient.

UNIT-III: DOUBLE INTEGRAL ANDLINE, INTEGRAL IN PLANES
Extreme values, Saddle points, Lagrange multipliers

UNIT-IV: TRIPLE INTEGRALS IN 3D
Double and integrated integrals, Area by double integration

UNIT-V: SURFACE INTEGRALS IN 3D
Triple integration and applications

TEXTBOOKS
1. Edwards, Henry C Thomas- Calculus, 14th edition. Chapters 12 to 16 relevant sections.
2. G.B. Thomas, Jr.and R. L. Finney, Calculus and Analytic Geometry, 9th Edn, Pearson Educations, India,1996.

REFERENCE BOOKS
1. T. M. Apostol, Calculus - Vol.2, 2nd Edn., Wiley India, 2003.

SEMESTER-II

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ME 103 L	Mechanical Engineering Tools Lab	ES	0	0	2	1

LIST OF PRACTICAL EXPERIMENTS
1. Step fitting of two metal plates using fitting tools.
2. Drilling & tapping for generating hole and internal thread on a metal plate.
3. Simple turning of cylindrical surface on MS rod using lathe machine tool.
4. Plumbing of bathroom/kitchen fitting using various plumbing components and tools.
5. Butt joint of two metal plates using arc welding process.

6. Lap joint of two metal plates overlapping on one another using arc welding process.
7. T-joint of a metal plate at perpendicular direction over another plate using arc welding process.
8. MIG welding of metal plates.
9. Cross halving joint of two wooden pieces at perpendicular direction.
10. Dovetail halving joint of two wooden pieces in the shape of dovetail.
11. To make circular shapes, grooving in wood piece using wood turning lathe.
12. To make duster from wooden piece using carpentry tools.
13. To make rectangular shaped tray using GI sheet.
14. To make geometrical shape like frustum, cone and prisms using GI sheet.
15. To make bigger size scoop using GI sheet. To forge chisel from MS rod using black smithy.

REFERENCES
1. Lab Manual
2. Kannaiah.P and Narayanan.K.C, "Manual on Workshop Practice", Scitech Publications, Chennai, 1999.
3. Gopal.T.V, Kumar.T, and Murali.G, "A first course on workshop practice – Theory, Practice and Work Book", Suma Publications, Chennai, 2005.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ENG 106	Engineering Graphics	ES	1	0	0	1

UNIT I: PROJECTION OF POINTS, LINES, PLANES, SOLIDS
Projection of points, Projection of lines, Projection of planes, Projection of solids, Use of software tool to create projections.

UNIT II: SECTIONS AND DEVELOPMENTS
Sections of solids, True shape of the section, Development of surfaces of sectioned solids, CAD exercises.

UNIT III: ISOMETRIC VIEWS
Isometric projections of simple and truncated solids, Isometric to orthographic and vice versa, Perspective projection, CAD exercises.

UNIT IV: GEOMETRIC DIMENSIONING AND TOLERANCES
GD and T rules and concepts, Geometric characteristics and modifiers, Fourier transform, bode plot, bandwidth, Datums and datum references, CAD exercises.

UNIT V FREE HAND SKETCHING AND CAD
Free hand sketching of real objects, Free hand sketching of multiple views from pictorial views, CAD exercises, Assignments of 2D and 3D drawings.

TEXT BOOKS
 Bhatt, N.D, Engineering Drawing, Charotar Publishers, 2014

REFERENCE BOOKS/OTHER READING MATERIAL
1.   Bhatt, N.D, Machine Drawing, Charotar Publishers, 2014.
2.   Venugopal, K. and Prabhu Raja, V., Engineering Graphics, Eighth Edition (Revised), New Age International Publishers, Chennai, 2007.
3.   Narayanan, K. L. and Kannaiah, P., Engineering Graphics, Scitech Publications, Chennai, 1999.

SEMESTER-II

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ENG 106 L	Engineering Graphics Lab	ES	0	0	2	1

LIST OF PRACTICAL EXPERIMENTS

1.GUI familiarity, features, commands.

2.Shortcuts, mouse features, drop down menus etc.

3.Sketch entities Inference line, centreline, line, circle, arc, ellipse.

4.Rectangle, slots, polygon, spline, points, text, snap, grid Sketch Tools Fillet, chamfer, offset, trim.

5.Extend, mirror, copy, rotate, scale, sketch.

6.Blocks, create blocks, add/remove, explode.

7.Relations, dimensioning.

8.Part modeling, extrude, revolve, swept, extruded cut.

9.Loft, reference, curves, fillet, pattern.

10.Assembly modeling, mating.

11.Manipulating components.

12.Surface modeling tools.

13.All views of the object, dimensions.

14.Drafting tools.

15.Simulation express, stress-strain analysis.

SEMESTER-II

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 204	Engineering Geology	C	3	0	0	3

UNIT I: INTRODUCTION

Definition, introduction and Scope of Geology for Civil Engineers and concerned organizations, Branches of Geology with their importance, definitions, Origin of the earth and different theories, Physical properties of Minerals- megascopic, Chemical Properties of Minerals, use of Instruments like SEM, XRD in mineral identification.

UNIT II: PETROLOGY

De Rock cycle, Specific Gravity of Rocks, determination, Co Concept of Hot Spring and Geysers, Characteristics of different Types of Magma, hoI Igneous Petrology- Different Classifications of Igneous Rocks. Detailed Study of Igneous Rocks- Granite, Gabbro, Basalt, Pegmatite, Rhyolite or Tuff, Felsite, and their Engineering Aspects, Ho Sedimentary Petrology, classification and study of some examples like Sand stone, Limestone, Shale, Conglomerate, Breccia, Mudstone, Co Metamorphic Petrology- Agents and Types of Metamorphism, Metamorphic Grades, Mineralogical Composition, Structures & Textures of Rocks, Schistosity, gneissocity.

UNIT III: PHYSICAL GEOLOGY

The weathering concept, types of weathering, Geological agents, erosion, denudation, waterfall, gorges, River meandering, oxbow lake, Uti Glacial deposits, solifluction deposits, Mud flows, Uti Desert landforms, Coastal deposits.

UNIT IV: STRENGTH BEHAVIOUR OF ROCKS

Concept of Rock Deformation & Tectonics, Stress and Strain in Rocks, Dip and Strike. Inliers and Outliers, Fold- Types and nomenclature, Criteria for their recognition in the field, Faults-Classification, recognition in field, effects on Outcrops, Joints - Types, Stresses responsible, Geotechnical importance, Unconformity- Types, Stresses responsible, Geotechnical importance.ng.

UNIT V: GEOLOGICAL HAZARDS

Rock instability and Slope Movement Concept of Sliding Blocks. Different Controlling Factors. Types of Land Slides. Prevention, Pe Land slides and its causes and Consequences, examples, Factors Controlling Ground Water, Capacity of Rock. Pervious and Impervious Rocks. Lowering of Water Table and Subsidence, Earthquake: Magnitude and Intensity of Earthquake. Seismic Sea Waves. Revelation from Seismic Records of Structure of Earth, Volcanoes. Types of Volcanic Eruption.

UNIT VI: ROCK MASSES AS CONSTRUCTION MATERIAL

Main Features that affects the Quality of Rock Engineering and Design. Effect of alteration and weathering, B Basic Element and Structures of Rock those are relevant In Civil Engineering areas, Rock Quality Designation. Rock Mass Description.

UNIT VII: GEOLOGY OF DAM AND RESERVOIR SITE

Eo Geological Considerations for selecting dams, reservoirs, Gg Different types of Rocks and their Special Features, Precautions to counteract Unsuitable Conditions, Gg Significance of discontinuities on the dam site and treatment to be given to such Structures.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL

1. Engineering and General Geology, by Parbin Singh, 2013, S.K.Kataria & Sons, 109, Prakash mahal, Opposite Delhi Medical association, Dayarganj, New Delhi-110002.
2. An introduction to Geology, by P.K.Mukharjee, 1990, The World Press Private LTD, 37A, College Street, Calcuuta-700073.
3. Physical and Engineering Geology, S.K.Garg, Dayarganj, New Delhi-110002.
4. A Text of Geology, by G.B.Mahapatra, 2012, C.B.S.Publishers and Distributors Pvt. Ltd., C.B.S.Plaza, 4819/XI, Prahlad Street, Dayarganj, New Delhi-110002.
5. Engineering Geology, by P.Purushothama Raj, 2014, Sri Krishna Hitech Publishing .Company Pvt. Ltd., plot No.14, Lakshmi Kanthammal, 1st street, Rajiv Nagar, Vanagaram, Chennai-600077.

SEMESTER-II

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 204 L	Engineering Geology Lab	C	0	0	2	1

The list of experiments for practical session:

I. Mineralogy: Megascopic Identification of Minerals based on the physical Properties
1. Quartz.

2. Feldspar (Orthoclase)/Pink.

3. Calcite.

4. Mica.

5. Graphite.

6. Barytes.

7. Asbestos.

8. Garnet.

9. Talc.

10. Bauxite.

II. Petrology: Megascopic Identification of Igneous Rocks

11. Granite.
12. Basalt.
13. Pegmatite.
14. Gabbro.
15. Dolerite.

Megascopic Identification of Sedimentary Rocks

16. Sand Stone.

17. Lime Stone.

18. Shale.

19. Breccia.

20. Conglomerate.

Megascopic Identification of Metamorphic Rocks

21.Slate.

22.Schist (mica & Chlorite schists).

23.Gneiss (Hornblende gneiss).

III. Structural Geology: Study of Plans & Sections
24. Study of Structural Geology Models.
25. Determination of Strike and Dip of a bed by using Clino and Brunton Compass.

26. Determination of Strike and Dip of a bed by using Clino and Brunton Compass.

27.Strike and Dip problems.

28 .Study of Geological map and identification of different lithounits.

29. Preparation of Geological Sections (Longitudinal & Cross Sections) for determination of thickness of beds.

30. Resistivity meter (wenner and Schlumberger methods) in ground water exploration.

SEMESTER-II

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CSE 131	Industry Standard Coding Practice - one	ES	0	0	4	1

UNIT I

Problem Solving with - Basic coding practices, Expression Evaluation, Operators Usage, Expressions, Control Structures, Loop & Iterations for all test case scenarios.

UNIT II

Problem Solving using time efficient logics, linear list data, Array problems, 2D Arrays and Matrix Data for all test case scenarios.

UNIT III

Problem Solving with - Pointers & Memory referencing, String Handling, functions for all test case scenarios.

UNIT IV

Problem Solving with - parameter passing, Recursions, Recursion Analysis, Structures and unions, Enumerations & Memory allocation for all test case scenarios.

UNIT V

Problem solving with - String manipulations. Lists, display patterns, strings, matrix, tuples, dictionaries, modules, packages, exception handling using Python.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL

1. Problem solving with C++ -9e- Walter Savitch – Pearson.
2. The complete Reference C, Fourth Edition – Herbert Schildt – MC Graw Hill.
3. Programming in Python 3, A complete introduction to Python language - 2e - Mark Summerfield – Addison-Wiley.

SEMESTER-II

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ISES 102	Industry Specific Employability Skills II	HS	1	1	0	1

UNIT I
Percentages, profit and loss, SI and CI, Time and work, Average and progression.

UNIT II
Time – speed and distance, Number system and arrangements.

UNIT III
Ratio and proportions, Mixtures and Alligation, Direction problems, Direction problems, coding and decoding, Number series and Alphabet series.

UNIT IV
Antonyms, synonyms, odd words, Idioms and phrasal verbs, same word with different part of speech.

UNIT V
Word analogy. Sentence completion, Text completion, Sentence equivalence.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. 1.Arun Sharma – How to prepare for Quantitative Aptitude, Tata Mcgraw Hill.
2. RsAgarwal,A Modern Approach to Verbal and Non Verbal Reasoning,S.Chand Publications.
3. Verbal Ability and Reading comprehension-Sharma and Upadhyay.
4. 4.Charles Harrington Elstor, Verbal Advantage: Ten Easy Steps to a Powerful Vocabulary, Large Print, September 2000.
5. GRE Word List 3861 – GRE Words for High Verbal Score, 2016 Edition.
6. The Official Guide to the GRE-General Revised Test, 2nd Edition, Mc Graw Hill Publication.

SEMESTER-III

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 209	Fluid Mechanics	C	3	0	0	3

UNIT I: PROPERTIES OF FLUID AND FLUID STATICS
Properties of Fluid; Fluid Continuum; Newtonian and Non - Newtonian fluids, Vapour pressure, Compressibility and Elasticity; Surface Tension and Capillarity, Fluid Statics: Variation of static pressure; Pascal's Law; Atmospheric, Absolute and gauge pressure, Pressure measurement by manometers; Pressure on plane surfaces and curved surfaces, Buoyant Force and Centre of Buoyancy; Stability of submerged bodies and floating bodies, Metacenter and metacentric height, Numerical Problems.

UNIT II: KINEMATICS AND DYNAMICS OF FLUID FLOW
Kinematics of Fluid Flow: Methods of describing fluid motion; Classification of flows, Laminar and turbulent flows, Three, two and one dimensional flows; Irrotational and rotational flows, Equation for acceleration; Convective acceleration; Local acceleration; Continuity equation, Velocity potential and stream function; Vortex flow – free vortex and forced vertex flow, Dynamics of Fluid Flow: Euler's equation of motion; Bernoulli's equation, Energy correction factor; Momentum principle; Applications of momentum equation.

UNIT III: MEASUREMENT OF FLOW THROUGH PIPES AND ORIFICES
Measurement of flow through Pipes – methods and various devices, Discharge through Venturi meter; Discharge through orifice meter, Numerical problems, Measurement of velocity by Pitot tube. Determination of coefficients for an orifice. Numerical problems, Flow through large rectangular orifice; Flow through submerged orifice, Classification of mouthpieces.

UNIT IV: FLOW THROUGH NOTCHES AND WEIRS
Flow through rectangular channels, Flow through triangular and trapezoidal notches and weirs, Cippoletti Weir; End contractions, Velocity of approach; Broad crested weir.

UNIT V: FLOW THROUGH PIPES, LAMINAR AND TURBULENT FLOWS
Flow through Pipes: Energy losses in pipelines, Numerical problems, Darcy–Weisbach equation; Minor losses in pipelines, Concept of equivalent length, Hydraulic power transmission through a pipe; Pipes in series and parallel, Laminar Flow: Relation between shear and Pressure Gradients in Laminar Flow, Reynold's experiment; Critical velocity; Steady laminar flow through a circular pipe, Laminar Flow between Parallel Plates, Laminar flow in pipes, Turbulent flow in pipes. Numerical problems.

TEXT BOOKS
1. S K Som, G Biswas, Suman Chakraborty, Introduction to Fluid Mechanics and Fluid machines, Tata McGraw Hill Education.
2. R. W. Fox, P. J.Pritchard, A. T Mcdonald, Introduction to Fluid Mechanics, John Wiley
3. F. M White, Fluid Mechanics, Tata McGraw Hill Education.

REFERENCE BOOKS/OTHER READING MATERIAL

1. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill Publishing Company.
2. R. K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications.

SEMESTER-III

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 203	Strength of Materials	C	3	0	0	3

UNIT I: SIMPLE STRESSES AND STRAINS

Introduction, Basic concepts, Simple stresses and strains; Elasticity and plasticity; Types of stresses and strains; Hooke's law; Stress-strain diagrams, Working stress; Factor of safety; Lateral strain; Volumetric strain and Poisson's ratio; Elastic moduli; Elastic constants for isotropic materials, Statically determinate and indeterminate problems, Bars of varying section–composite bars; Temperature stresses, Strain energy; Resilience – Gradual, sudden, impact and shock loadings.

UNIT II: SHEAR FORCE AND BENDING MOMENT

Introduction to types of beams, supports and loadings; Shear force and bending moment, Cantilever, simply supported and overhanging beams subjected to point loads, UDL, uniformly varying loads and combination of these loads, Point of contra flexure – Relation between S.F.,B.M and rate of loading at a section of a beam, Couple and their combinations.

UNIT III: FLEXURAL STRESSES

Theory of simple bending and assumptions, Derivation of bending equation: $M/I = f/y$
E/R, Neutral axis; Determination bending stresses, Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections.

UNIT IV: SHEAR STRESSES

Derivation of formula; Shear stress distribution, rectangular, circular, triangular, I, T angle sections, built up beams, shear center.

UNIT V: TORSION IN CIRCULAR SHAFTS

Introduction; Pure torsion; Assumptions; derivation of torsion equation for circular shafts, torsional rigidity and polar modulus, power transmitted by a shaft, power transmitted by a shaft.

TEXTBOOKS

1. Strength of materials, S. Ramamrutham and R. Narayanan, Dhanpat Rai publishers.
2. A textbook of strength of materials, R. K. Bansal, 5th Ed., Laxmi publications.
3. Strength of materials, B. C. Punmia, Ashok K. Jain and Arun K. Jain, Laxmi publications.

REFERENCE BOOKS

1. Elements of strength of materials, S. P. Timoshenko and D. H. Young, 5th Ed., East-West press.
2. Mechanics of materials, Ferdinand P. Beer, E. Russell Johnston and Jr. John T. DeWolf, 3rd Ed.,

Tata McGraw-Hill.

3. Mechanics of materials, Russel C. Hibbeler, 9th Ed., Pearson publications.

SEMESTER-III

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 203 L	Strength of Materials Lab	C	0	0	2	1

LIST OF PRACTICAL EXPERIMENTS

1. 1.Tensile test on Mild steel rod.
2. Compression test of Concrete cubes and cylinders.
3. Test on open coil and closed coil Helical springs.
4. Izod & charpy impact test.
5. Torsion test on Graded steels.
6. Deflection test on beams of different materials using Maxwell reciprocal theorem.
7. Double shear test on metallic materials.
8. Rockwell &Brinell hardness test of metallic materials.
9. Bend test of metallic rods.
10. Fatigue testing of materials under notched and unnotched conditions.
11. Comparison of mechanical properties of Unhardened, Quenched and tempered specimen.
12. Strain measurement on rods and beams.
13. Study on photo elasticity.
14. Buckling analysis.
15. Creep Test.

SEMESTER-III

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 206	Surveying	C	3	0	0	3

UNIT I: INTRODUCTION TO SURVEYING

Principles, Linear, Angular and graphical methods, Survey Stations, Survey lines - Ranging, bearing of survey lines, Leveling, Plane table Surveying, Principles of Leveling - booking and reducing levels; differential, reciprocal, profile Leveling and cross-sectioning. digital and Auto level, Errors in Leveling, Contouring: Characteristics, methods, uses; areas and Volumes. Triangulation and Trilateration (6 hours): Theodolite Survey: Instruments, Measurement of horizontal and vertical angle horizontal and vertical control- methods - Triangulation - network - Signals. Baseline - Choices - instruments and accessories - extension of baselines - Corrections- Satellite station - reduction to centre - intervisibility of height and distances - Trigonometric Leveling - Axis Single Corrections.

UNIT II: CURVES

Elements of simple and compound curved - Method of setting out - Elements of Reverse Curve - Length of curve - Elements of transition curve - Vertical Curves.

UNIT III: MODERN FIELD SURVEYS

Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station - Accessories - Advantages and applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems - Segments, GPS measurements, errors and biases, Surveying with PS, Co-Ordinate transformation, accuracy considerations.

UNIT IV: PHOTOGRAMMTRY SURVEYING

Introduction, Basic Concepts, Perspective geometry of aerial photography, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension of photographic mapping - aerial triangulation, radial triangulation, methods; Photographic mapping - mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes

UNIT V: REMOTE SENSING

 Introduction - Electromagnetic spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: Platforms and sensors; Visual image interpretation; digital image processing

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL

1. 1.Madhu, N, SAhithi Kumar, R and Sathesh obi, Advanced Surveying: Total Station, IS and Remote Sensin, Pearson India, 2006.
2. B.C.Punmia, Ashok Kumar Jain, Arunkumar, Surveying Vol-I & Vol-II, Laxmi Publications (P) Ltd, 22, Golden House, Darya Ganj, New Delhi-110002.
3. Manoj, K, Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011.
4. Bhavikatti, S.S. , Surveying and levelling, Vol. I and II, K. International, 2010.

5. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.

6. Anji Reddy, M., Remote Sensing and Geographical information system, B.S. Publications, 2001.

7. Arora, K.R., Surveying, Vol-I. II and III, Standard Book House, 2015.

SEMESTER-III

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 206 L	Surveying Lab -I	C	0	0	2	1

I. CHAIN SURVEYING
1. Introduction to chain surveying.
2. Direct ranging by Chain surveying.
3. Indirect Ranging by Chain surveying.
4. Area Calculation by chain surveying.
5. Widening of the Road by chain surveying.

II. COMPASS SURVEYING
6. Area Calculation by Compass Surveying.
7. Inaccessible points by compass surveying.

III. PLANE TABLE SURVEYING
8. Radiation Method by plane table surveying.
9. Intersection Method by plane table surveying.
10. Traversing by plane table surveying.

IV. DUMPY LEVEL SURVEYING
11. Simple Levelling
12. Differential Levelling
13. Profile levelling
14. Longitudinal and Cross Section of a Road
15. Reciprocal Levelling

V. THEODOLITE SURVEYING
16. Introduction to Theodolite
17. Repetition
18. Reiteration
19. Measurement of vertical Heights

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Pravesh Saini, 2018 Laboratory Manual, Surveying , by, Government Engineering College, Ajmer.
2. B.Suresh,2019, Surveying Laboratory Manual, , Institute of Aeronautical Engineering (Autonomous) Dundigal, Hyderabad - 500 043
3. K.G. Reddy, 2018, Surveying Laboratory Manual, JNTU, Hyderabad.
4. Surveying-1, Laboratory Manual, 2018 by AURORA'S TECHNOLOGICAL AND RESEARCH INSTITUTE Uppal, Parvathapur, JNTUK.
5. B.C.Punmia, Ashok Kumar Jain, Arunkumar, Surveying Vol-I & Vol-II, Laxmi Publications

(P) Ltd, 22, Golden House, Darya Ganj, New Delhi-110002.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
MAT 131	Differential Equations	BS	3	0	0	3

UNIT I: FIRST ORDER DIFFERENTIAL EQUATIONS
Classification of ODEs (Linear, Non-linear, Exact, Separable, Geometric meaning of $y' = f(x, y)$), Direction Fields, Numerical methods for solving ODEs, Euler's Method, Integrating Factor, Bernoulli Equations, Initial Value Problem, Existence and Uniqueness, Picard's method, Modelling (Free falling object, Radioactivity, RL-circuit).

UNIT II: SECOND AND HIGHER ORDER LINEAR ODES
Homogeneous Linear ODEs, Modelling of Free Oscillations of a Mass-Spring System, Euler-Cauchy Equations, Non-homogeneous ODEs, Variation of Parameters, Modelling (Forced Oscillations, Electric Circuits).

UNIT III: SYSTEM OF ODES
Modelling Engineering problems (Electric Network, Mixing problem in two tanks etc.) as systems of ODEs, Wronskian, Phase-Plane Method, Critical Points & Stability, Qualitative Methods for Nonlinear Systems, Nonhomogeneous Linear Systems of ODEs.

UNIT IV: SERIES SOLUTIONS OF ODES
Introduction to power series method, Legendre's equation & polynomials, Frobenius Method, Bessel's Equations & Functions.

UNIT V: LAPLACE TRANSFORMS
Laplace transforms of standard functions, Shifting Theorems, Transforms of derivatives and integrals, Unit step function, Dirac's delta function, Inverse Laplace transforms, Convolution theorem (without proof)., Application: Solutions of ordinary differential equations using Laplace transforms.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Willaim Boyce and Richard DiPrima, Elementary Differential Equations and Boundary Value Problems, 11th Edition, Wiley-India.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
3. Mary L. Boas, Mathematical Methods in Physical Sciences, 3rd Edition, Wiley-India.
4. G. F. Simmons, Differential Equation with Applications and Historical Notes, TATA McGraw Hill.
5. S. Vaidyanathan, Advanced Applicable Engineering Mathematics, CBS Publishers.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 208	Building Planning & Drawing using CAD	C	3	0	0	3

UNIT I: BUILDING BYELAWS AND REGULATIONS
Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index-principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations-height of buildings- wall thickness – lightening and ventilation requirements.

UNIT II: RESIDENTIAL AND PUBLIC BUILDINGS
Minimum standards for various parts of buildings requirements of different rooms and their grouping-characteristics of various types of residential buildings and relationship between plan, elevation and forms and functions, Public Buildings Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation, Landscaping requirements.

UNIT III: DOORS, WINDOWS, VENTILATORS AND ROOFS
Panelled-door, panelled and glazed door, glazed windows, panelled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof and buildings: drawing plans, Elevations and Cross Sections of given sloped and flat roof buildings.

UNIT IV: COMPUTER AIDED DRAFTING
Generation of points, lines, curves, polygons, dimensioning. Types of modelling: object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, Isometric projections, orthographic projections of isometric projections.

UNIT V: PLANNING AND DESIGNING OF DIFFERENT TYPES OF BUILDINGS
Draw the Plan, Elevation and Sections of a Residential and Public buildings from the given line diagram.

TEXTBOOKS
1. Planning, designing and Scheduling, Gurucharan Singh and Jagadish Singh
2. Building planning and drawing by M. Chakravarthi.
3. Engineering drawing by N.D Bhatt , Charotar publications.
4. Mastering AutoCAD 2021 and AutoCAD LT 2021, Brain C. Benton and George Omura, Wiley Publishers.

REFERENCE BOOKS
1. National Building Code (latest).
2. Building Design and construction by Frederick Merrit, Tata McGraw Hill.
3. Times Saver standards of Architectural Design Data by Callender, Tata McGaw Hill.
4. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings.
5. Development plan and DCP Rules of urban local body, New Delhi, Volume 12.
6. Model building bye laws by MoUD, GoI.

7. Introduction to AutoCAD 2020 for Civil Engineering Applications, Nighat Yasmin, SDC Publications.

SEMESTER-III

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ISES 201	Industry Specific Employability Skills - III	HS	1	1	0	1

UNIT I
Percentages, profit and loss, SI and CI, Time and work, Average and progression.

UNIT II
Time – speed and distance, Number system and arrangements.

UNIT III
Ratio and proportions, Mixtures and Alligation, Direction problems, Direction problems, coding and decoding, Number series and Alphabet series.

UNIT IV
Antonyms, synonyms, odd words, Idioms and phrasal verbs, same word with different part of speech.

UNIT V
Word analogy. Sentence completion, Text completion, Sentence equivalence.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Arun Sharma – How to prepare for Quantitative Aptitude, Tata Mcgraw Hill.
2. RsAgarwal,A Modern Approach to Verbal and Non Verbal Reasoning,S.Chand Publications.
3. Verbal Ability and Reading comprehension-Sharma and Upadhyay.
4. Charles Harrington Elstor, Verbal Advantage: Ten Easy Steps to a Powerful Vocabulary, Large Print, September 2000.
5. GRE Word List 3861 – GRE Words for High Verbal Score, 2016 Edition.
6. The Official Guide to the GRE-General Revised Test, 2nd Edition, Mc Graw Hill Publication.

SEMESTER-III

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CSE 232	Industry Standard Coding Practice -two	ES	0	0	4	1

UNIT I

Problem Solving with - Basic coding practices, Expression Evaluation, Operators Usage, Expressions, Control Structures, Loop & Iterations for all test case scenarios.

UNIT II

Problem Solving using time efficient logics, linear list data, Array problems, 2D Arrays and Matrix Data for all test case scenarios.

UNIT III

Problem Solving with - Pointers & Memory referencing, String Handling, functions for all test case scenarios.

UNIT IV

Problem Solving with - parameter passing, Recursions, Recursion Analysis, Structures and unions, Enumerations & Memory allocation for all test case scenarios.

UNIT V

Problem solving with - String manipulations. Lists, display patterns, strings, matrix, tuples, dictionaries, modules, packages, exception handling using Python.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Problem solving with C++ -9e- Walter Savitch – Pearson.
2. The complete Reference C, Fourth Edition – Herbert Schildt – MC Graw Hill.
3. Programming in Python 3, A complete introduction to Python language - 2e - Mark Summerfield – Addison-Wiley.

SEMESTER-IV

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 201	Concrete Technology	C	3	0	0	3

UNIT I: OVERVIEW OF CONCRETE AND CONSTRUCTION MATERIALS

Nature and advantages of concrete, Overview of various construction materials, Overview of Cement, Overview of fine and coarse aggregates, Properties of water, Role of chemical and mineral admixtures.

UNIT II: CEMENT

Manufacture and composition of cement, Modified portland cements, Specifications and tests for portland cements, Chemistry of hydration, Properties of hydration products, Microstructure and properties of hydrated cement paste, Blended cements, fly ash and slag, Effect of fly ash and slag on properties of fresh and hardened concrete.

UNIT III: WATER, AGGREGATES AND ADMIXTURE

Water quality, Classifications and properties of aggregates, Non standard aggregates, Use of chemical admixture, Water reducing admixture, Admixture for set control.

UNIT IV: PROPERTIES OF CONCRETE, CURING CONDITIONS AND MIX DESIGN

Workability and properties of fresh concrete, Factors influencing workability, setting of concrete and tests for fresh concrete, finishing of concrete and role of curing temperature, Tests for compressive strength, Quality assessment of concrete and other methodologies, Fundamentals of mix design, Mix design as per BIS Method.

UNIT V: DURABILITY AND SPECIAL CONCRETES

Permeability of concrete, Physical attack, Chemical attack-carbonation, Sulphate attack and chloride attack, High strength concrete, Self-compacting concretes, Lightweight concretes and other concretes.

TEXT BOOKS

1. Shetty, M. S., and Jain, A K., "Concrete Technology: Theory and Practice", 8th Edition, S,chand publications., New Delhi, 2019.
2. Nevelli, A.M., "Properties of Concrete", – 5th Ed, Prentice Hall Publishers, 2012.
3. Gambhir, M.L., "Concrete Technology", Tata Mc Graw Hill Publishers – 2012.

REFERENCE BOOKS/OTHER READING MATERIAL

1. Mindess, Sidney., Young, J.F., Darwin, D., "Concrete", Pearson Education, 2003.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 201 L	Concrete Technology Lab	C	0	0	2	1

I. PROPERTIES OF CEMENT
1. Type of cement.
2. Setting behavior of cement.
3. Specific gravity and fineness of cement.
4. Soundness of cement.
5. Identification of grade cement.

II. AGGREGATES
6. Classification of aggregates.
7. Sieve analysis of fine aggregates.
8. Specific gravity, water absorption of fine aggregates.
9. Bulking and packing density of fine aggregates.
10. Sieve analysis of coarse aggregates.
11. Specific gravity, water absorption of coarse aggregates.
12. Flakiness and elongation index of aggregates.

III. PROPERTIES OF FRESH CONCRETE
13. Preparation of fresh concrete
14. Workability of concrete
15. Air content of concrete
16. Compaction factor of concrete
17. Flow table measurements

IV. PROPERTIES OF HARDENED CONCRETE
18. Preparation of concrete molds.
19. Density of concrete.
20. Strength of the concrete.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Properties of Concrete – AM Nevelli – 5th Ed, Prentice Hall Publishers, 2012.
2. Concrete Technology – M. S. Shetty – S Chand Co., Publishers – 2018.
3. Concrete Technology – M. L. Gambhir – Tata Mc Graw Hill Publishers – 2012.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 210	Structural Analysis	C	3	0	0	3

UNIT I: INTRODUCTION: REVIEW OF BASIC CONCEPTS IN MECHANICS
Introduction, Different types of structures, Loads on the structural system, Static Equilibrium, Constitutive Relations and Compatibility Conditions, Static Indeterminacy of Structures, Symmetry and Antisymmetry, Tutorial.

UNIT II: ANALYSIS OF STATICALLY DETERMINATE STRUCTURES
Internal Force on a System, Review of Axial Force, Bending Moment and Shear Force Diagram, Analysis of Truss: Method of Joints, Analysis of Truss: Method of Sections, Examples, Tutorial.

UNIT III: CABLES
Introduction to Cable systems, The General Cable Theorem, Application of the General Cable Theorem for Distributed Loading, Arches and suspension cables, three hinged arches and suspension cables, Examples, Tutorial.

UNIT IV: DEFLECTION OF STRUCTURES
Moment Area Method, Conjugate Beam Method, Principle of Virtual Work, Strain Energy Method, Bending Deflection Due to Temperature Variation, Maxwell-Betti Law of Reciprocal Deflections, Examples, Tutorials.

UNIT V: INFLUENCE LINES
Introduction: Variable Loadings, Construction of Influence Lines using Equilibrium Methods, Use of Influence Lines, Müller-Breslau Principle, Examples, Tutorial.

TEXT BOOKS
1. R.C. Hibbeler, Structural Analysis, Pearson Education.
2. C.S. Reddy, Basic Structural Analysis, Tata McGraw Hill.
3. C.H. Norris, J.B. Wilbur, S.Utku, Elementary Structural Analysis, Tata McGraw Hill.

REFERENCE BOOKS/OTHER READING MATERIAL
1. L. S. Negi and R. S. Jangjid, Structural Analysis, Tata Mc. Graw.
2. D.S. Prakash Rao, Structural analysis: Unified approach, Universities Press.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 306	Water Resources Engineering	C	3	0	0	3

UNIT I: INTRODUCTION

Introduction: Hydrologic cycle, Water-budget equation, Applications in engineering, Sources of data, Precipitation: Forms of precipitation, characteristics of precipitation in India, Measurement of precipitation, rain gauge network, Mean precipitation over an area Depth-Area-Duration relationships, Depth-Duration-Frequency relationships, Probable maximum precipitation and rainfall data in India.

UNIT II: ABSTRACTIONS FROM PRECIPITATION

Evaporation process, Evaporimeters, analytical methods of evaporation estimation, Reservoir evaporation and methods for its reduction, Evapotranspiration, measurement of evapotranspiration, Evapotranspiration equations, Potential evapotranspiration over India and actual evapotranspiration, Interception, depression storage, Infiltration, infiltration capacity, measurement of infiltration.

UNIT III: RUNOFF

Runoff volume, SCS-CN method of estimating runoff volume, Flow duration curve, flow-mass curve, Hydrograph, factors affecting runoff hydrograph, Components of hydrograph,

Base flow separation, Effective rainfall, Unit hydrograph – applications and limitations Unit hydrograph from direct runoff hydrograph, S-Hydrograph, Surface water resources of India, environmental flows.

UNIT IV: GROUND WATER AND WELL HYDRAULICS

---Ground water hydrology---

Occurrence, movement and distribution of ground water, Aquifers – Types, specific yield, permeability, Darcy's law, ---Well hydraulics---, Steady state flow in wells, Equilibrium equations for confined and unconfined aquifers, aquifer tests, Well constants

UNIT V: WATER REQUIREMENTS

Crop water requirements: Water withdrawals and uses –water for energy production, Water for agriculture, Water for hydroelectric generation; flood control. Analysis of surface water supply, Water requirement of Crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, Infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

UNIT VI: DESIGN OF CANALS

Distribution systems -canal systems, alignment of canals, canal losses,

Estimation of design discharge.

Design of channels-rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of

regime channels.
Lining of canals, types of lining

TEXTBOOKS
1. K. Subramanya, Hydrology (Tata Mc Graw Hill Education).
2. S. K. Garg, Irrigation engineering and hydraulic structures (Khanna publishers).
3. V.P. Singh, Elements of Engineering Hydrology (Tata Mc Graw Hill Education).
4. Jaya Rami Reddy, Engineering Hydrology.

REFERENCE BOOKS/OTHER READING MATERIAL
5. K.N. Duggal and J.P. Soni, Elements of Water Resources Engineering (New age international)
6. K. Subramanya, Flow in open channels (Tata McGraw-Hill Education)

SEMESTER-IV

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 211 L	Surveying Lab - II	C	0	0	2	1

LIST OF PRACTICAL EXPERIMENTS

Theodolite
1. Introduction to Advanced Surveying Laboratory- Electronic Theodolite & Total Station.
2. Study of Theodolite in detail-practice for measurement of horizontal and vertical angles .
3. Measurement of horizontal angles by repetition method.
4. Measurement of horizontal angles by Reiteration method.
5. Trigonometric leveling-heights and distance problem.
6. Heights and distance using principles of Tachometric surveying.
7. Measurement of Vertical heights.
8. Setting out works for buildings & pipe lines.

Total Station
11. Determine of area using Total Station
12. Traversing by Total Station
13. Contouring using Total Station
14. Determination of Remote height using total station
15. Stake out using total station
16. Measurement of Distance, gradient, difference in height between two inaccessible points using total station
17. Curve Setting and different methods
18. Setting out works for buildings & pipe lines
19. Position Fixing Using Global Positioning System (GPS) in the field

Resistivity meter
20. Measurement of Resistance of Sub-surface formations by Wenner's method.
21. Measurement of Resistance of Sub-surface formations by Schlumberger method.

SEMESTER-IV

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
MAT 221	Probability & Statistics for Engineers	BS	3	0	0	3

UNIT I
Basic principle of counting, permutations, combinations, Multinomial coefficients, sample space and events, Axioms of probability, sample spaces having equally likely outcomes, Conditional probability, Bayes` theorem, independent events.

UNIT II
Random variable, discrete random variable, expected value, expectation of a function of a random variable, variance, discrete probability distributions- Bernoulli, Binomial, Poisson, Geometric, negative, Binomial distributions, expected value of sums of random variables, cumulative distribution function and its   properties.

UNIT III
Continuous random variables, Expectation and variance – their properties, Continuous probability distributions – uniform, normal, exponential distributions, Distribution functions.

UNIT IV
Joint distribution functions, Independent random variables and their sums, conditional distributions, Joint probability distribution of functions of random variables, covariance, correlation

UNIT V
Definition of statistics, population and sample, Representative sample, Descriptive statistics – classification and tabulation of univariate data, Graphical representation, frequency curves

TEXTBOOKS
1. Sheldon Ross, A First course in probability (Ninth edition).

REFERENCE BOOKS
1. Michael Baron, Probability and Statistics for computer scientists.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 209 L	Fluid Mechanics and Hydraulic Machinery Lab	C	0	0	2	1

LIST OF PRACTICAL EXPERIMENTS:

1. Determination of fluid properties

a) Density

b) Viscosity

2. Pressure measurements

 a.) U-tube manometer

3. Verification of Bernoulli's theorem

4. Find the coefficient of discharge of

 a) Rectangular notch

b) Triangular notch

 5. Find the coefficient of discharge of
  a) Venturimeter
  b) Orificemeter
 6. Determination of hydraulic co-efficient of orifices
 7. Co-efficient of discharge for a given mouthpiece
 8. Stability of floating body and determination of Metacentric height.
 9. Determine the friction losses: straight pipes, bends, sudden expansion and contraction, smooth vs rough pipe.
 10. Determination on Reynold's number.
 11. Determination of velocity using a pitot tube.

TEXTBOOKS
1. S K Som, G Biswas, Suman Chakraborty, Introduction to Fluid Mechanics and Fluid machines, Tata McGraw Hill Education.

2. R. W. Fox, P. J.Pritchard, A. T Mcdonald, Introduction to Fluid Mechanics, John Wiley

3. F. M White, Fluid Mechanics, Tata McGraw Hill Education.

REFERENCE BOOKS/OTHER READING MATERIAL
4. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill Publishing Company.
5. R. K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 205	Geotechnical Engineering-I	C	3	0	0	3

UNIT I: INTRODUCTION AND CLASSIFICATION

Introduction to soil formation; soil structure and clay mineralogy; Adsorbed water; Basic Definitions and Relationships-Soil as three-phase system, Mass-volume relationships; Relative density; Determination of Moisture content; Specific gravity; Unit weight; Physical characterization of soil, Grain size analysis-dry& wet conditions; Consistency limits, Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

UNIT II: SEEPAGE AND PERMEABILITY

Introduction, one dimensioned flow of water through soils Darcy's law and its validity, Laboratory permeability tests, Factors affecting permeability, Permeability of stratified soil masses, Seepage through soils, Quick condition, Flow nets.

UNIT III: STRESSES IN SOILS

Stresses in soils; Stresses induced by applied loads, Boussinesq's and Westergaard's theories for point loads and area loads, Newmark's influence chart; 2:1 stress distribution method, Contact pressure under rigid and flexible area, Computation of displacements from elastic theory.

UNIT IV: COMPACTION AND CONSOLIDATION

Mechanism of compaction; factors affecting, Laboratory and field compaction methods, Compressibility of soils; Stress history, Concept of consolidation by spring analogy, Terzaghi's theory of one-dimensional Consolidation; Time rate of consolidation and degree of consolidation, Determination of coefficient of consolidation, Over consolidated and normally consolidated clays.

UNIT V: SHEAR STRENGTH OF SOILS

Shear strength of soils; Principal planes; Mohr – Coulomb Failure theories, Stress strain behavior of sands and clays; Critical void ratio, Shear strength determination – UCS, Shear box test, Triaxial – UU, CU, CD, Vane shear test.

TEXTBOOKS

1. Principles of Geotechnical Engineering, Braja M. Das, Cengage Learning.
2. Basic and Applied Soil Mechanics, Gopal Ranjan and A. S. R. Rao, New Age International Publishers.

REFERENCE BOOKS

1. An Introduction to Geotechnical Engineering, Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ.
2. Soil Mechanics, Craig R.F., Chapman & Hall.
3. Fundamentals of Soil Engineering, Taylor, John Wiley & Sons.

4. Soil Mechanics in Engineering Practice, Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri.

SEMESTER-IV

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ISES 202	Industry Specific Employability Skills IV	HS	1	1	0	1

UNIT I
Permutation and Combination, Probability, Geometry, and Algebra.

UNIT II
Clocks, Calendars and Blood Relations, Arrangements, Cubes and Syllogism.

UNIT III CRITICAL REASONING
Introduction to Different Parts of an Argument in Reasoning, Assumption of an Argument, strengthening of an Argument, Weakening of an argument, **Para** jumbles.

UNIT IV VERBAL REASONING
Word Analogy, Sentence Completion & Text Completion, Sentence Equivalence.

UNIT V
Reading Comprehension, Identification of errors, Sentence correction.

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Arun Sharma – How to prepare for Quantitative Aptitude, Tata Mcgraw Hill.
2. RsAgarwal,A Modern Approach to Verbal and Non Verbal Reasoning,S.Chand Publications.
3. Verbal Ability and Reading comprehension-Sharma and Upadhyay.
4. Manhattan GMAT Sentence Correction Guide, 5th Edition.
5. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning. S.Chand Publications.
6. The Official Guide to the GRE-General Revised Test, 2nd Edition, Mc Graw Hill Publication.

SEMESTER-IV

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CSE 234	Industry Standard Coding Practice - three	ES	0	0	4	1

UNIT I
Problems Solving with: Structure Pointers, formation of links, Operations on Linked lists, Operations on a circular linked list, Operations on a double linked list & Industry Standard Practice Questions.

UNIT II
Problem Solving with - Stack Operations, Queue data structure Implementation, Linear / Binary Search Algorithms, Sorting Algorithms, Industry Standard Practice Questions.

UNIT III
Problem Solving with - Nonlinear data structures, trees operations, application of search property on a binary tree, tree balancing.

UNIT IV
Problem Solving with - Multiway search structures, Operations on a 2-4 tree, nonlinear structures, red, black trees & operations, Tries, String Algorithms & Industry Standard Practice Questions.

UNIT V
Problem Solving with – features of Object-oriented programming, leveraging Standard Template Libraries. Industry Standards of leveraging DBMS concepts, SQL Queries, Entity Relationship Models, Query Optimization, Transactions & Concurrency, Normalization & Industry Standard Practice Questions.

TEXTBOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Fundamentals of Data Structures in C++ - 2e- Sahni Horowitz - Universities Press.
2. Algorithms -4e- Robert Sedgewick & Kevin Wayne - Addison-Wesley Professional.
3. C++ Standard Library A Tutorial and Reference – 2e - Nicolai M. Josuttis - Addison Wesley Longman.
4. An Introduction to Database Systems – 8e - C.J. Date – Pearson.
5. Competitive Programming – 3e – Steven Halim, Felix Halim.

SEMESTER-V

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 202	Reinforced Concrete Design	C	3	0	0	3

UNIT I: INTRODUCTION OF RCC MATERIALS
Review of Concrete making materials, Structural concrete Grades, Properties of Concrete, Modulus of elasticity-flexural strength, Characteristic and Design values, Partial safety factor.

UNIT II: DESIGN OF BEAMS
RCC- Limit State method- Assumptions, Stress-Strain behavior of Steel and Concrete, Working stress method- comparison of design process, Analysis and Design of Singly Reinforced Beams, Analysis of Singly Reinforced RC Section- Neutral axis-Balanced-Under Reinforced-Over Reinforced Sections- Moment of Resistance- Design parameters, Design examples, Analysis and Design of Doubly Reinforced Beams, Necessity of Doubly Reinforced sections, Analysis of Doubly Reinforced RC Section-Moment of Resistance, Design parameters and design Examples.

UNIT III: DESIGN OF SLABS
Design of One-way slab, Design of Two-way slabs, Effect of edge conditions- Moment of resistance- Torsion reinforcement at corners, Design examples, Design of Continuous Slab/Beam, Effect of continuity- analysis of continuous beam/slab, Moment and shear coefficients for continuous beam/slab- Critical sections.

UNIT IV: DESIGN OF COLUMNS
Design principles of RC columns, Assumptions- Rectangular and Circular columns- Helical reinforcement, Minimum Eccentricity-Use of Interaction diagrams for Axial load and Moment.

UNIT V: DESIGN OF FOOTINGS
RC footings, Minimum depth of footing, Safe bearing capacity, Design for Bending-Shear in One way, Shear in Two way- Transfer of load at base of column.

TEXT BOOKS
1. IS-456-2000, IS 3370(Part-IV), BIS 2000.
2. Reinforced Concrete Design- S Unnikrishna Pillai and Devdas Menon
3. Design of Reinforced Concrete Structures (Limit State) – A.K.Jain, 1st Edition, Nemchand Brothers, Roorkee.
4. RCC Designs-B.C.Pummia, A.K.Jain and A.K.Jain, 10th edition Lakshmi Publications Ltd, New Delhi.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 302	Geotechnical Engineering - II	C	3	0	0	3

UNIT I: SLOPE STABILITY

Infinite and finite earth slopes in sand and clay, Types of failures – factor of safety of infinite slopes, stability analysis by Swedish arc method, standard method of slices, Taylor's Stability Number-Stability of slopes of dams and embankments – different conditions.

UNIT II: LATERAL EARTH PRESSURES & RETAINING WALLS

Rankine's & Coulomb's theory of earth pressure, Culmann's graphical method – earth pressures in layered soils, Types of retaining walls, Design approach for gravity retaining wall, cantilever retaining wall, bulk heads, anchored bulk heads.

UNIT III: SHALLOW FOUNDATIONS

Types of foundations and factors to be considered in their location, Bearing capacity – criteria for determination of bearing capacity, Factors influencing bearing capacity – analytical methods to determine bearing capacity, Terzaghi's theory - IS Methods, Safe bearing pressure based on N- value – allowable bearing pressure; Safe bearing capacity and settlement from plate load test.

UNIT IV: DEEP FOUNDATIONS

Types of piles – Load carrying capacity of piles based on static pile formulae, Dynamic pile formulae– Pile load tests - Load carrying capacity of pile groups in sands and clays, Types – Different shapes of well, Types of caissons – Components of well - functions – forces acting on well foundations, Design Criteria – Determination of steining thickness and plug - construction and Sinking of wells – Tilt and shift.

UNIT V: SOIL EXPLORATION

Need – Methods of soil exploration, Boring and Sampling methods, Field tests – Penetration Tests – Pressure meter, Planning of programme and preparation of soil investigation report.

SEMESTER-V

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 302 L	Geotechnical Engineering Lab	C	0	0	2	1

LIST OF PRACTICAL EXPERIMENTS

1. Consistency Limits
Liquid limit, Plastic limit, Shrinkage limit.

2. Soil Gradation
Sieve analysis, Hydrometer analysis

3. Specific Gravity
Density bottle method, Pycnometer method

4. Unit Weight
Determination of Unit Weight by Core cutter Method, Determination of Unit Weight by Sand Replacement Method, Relative Density by Vibration Table Test.

5. Compaction
Standard Proctor Compaction, Modified Proctor Compaction

6. Hydraulic Conductivity
Constant Head Permeability Test, Falling Head Permeability Test

7. Consolidation

8. Strength Tests
Unconfined Compressive Strength (UCS), Unconsolidated Undrained Triaxial Test,
(UU), Laboratory Vane Shear Test,Direct Shear Test,California Bearing Ratio Test (CBR)

REFERENCE BOOKS
1. Experimental Soil Mechanics, Jean P. Bardet, Prentice Hall Publishers.
2. Soil Mechanics Laboratory Manual, Braja M. Das, 6th Ed., Oxford University Press.
3. Soil Mechanics Lab Manual, Michael E. Kalinski, 2nd Ed., Wiley Publishers.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 207	Transportation Engineering	C	3	0	0	3

UNIT I: HIGHWAY NETWORK PLANNING AND ALIGNMENT
Transportation and Society, Transportation Modes, Road Classification and Patterns, Road Development plans, Highway Alignment Requirements, factors controlling alignment, Engineering Surveys, Detailed Project Report.

UNIT II: HIGHWAY GEOMETRIC DESIGN
Highway Cross Section Elements, Sight Distance characteristics of highways, Numerical Problems, Design of Horizontal Alignment- Super elevation and transition curves, Numerical Problems, Extra widening, Numerical Problems, Extra widening, Numerical Problems, Design of Vertical Alignment- Grades and Grade Compensation, Numerical Problems, Types of vertical curves and design. Numerical Problems.

UNIT III: TRAFFIC FLOW CHARACTERISTICS AND DESIGN OF INTERSECTIONS
Road User and Vehicle Characteristics, Traffic Studies: Volume, speed, Traffic Studies: Travel time and delay, parking study, Traffic Stream Characteristics, PCU and Peak Hour Factor, Traffic Stream Characteristics, PCU and Peak Hour Factor, Capacity and Level of Service of Highways, Design of Traffic Control Devices, Signal Design by Webster's Method, Design of Roundabouts- IRC and HCM methods.

UNIT IV: PAVEMENT MATERIALS, TESTING AND DESIGN OF PAVEMENTS
Highway materials - desirable properties and quality control tests, Marshal Method of Bituminous Mix Design, Types of Pavement Structures, Factors Controlling Design of Pavements, Stresses in Pavements, Design of Flexible Pavements- IRC and AASHTO Method of Design, Design of Rigid Pavements- IRC and AASHTO Method of Design.

UNIT V: HIGHWAY CONSTRUCTION AND MAINTENANCE
Construction Procedure for various layers of flexible pavements, Construction Procedure for various layers of rigid pavements, Distresses in flexible and Rigid Pavements, Maintenance of bituminous and concrete pavements.

TEXT BOOKS
1. Fred L. Mannering, Scott S.Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India.
2. Partha Chakraborty and Animesh Das, Principles of Transportation Engineering, Prentic Hall India.
3. S. K. Khanna., C. E. G. Justo and A. Veeraragavan, Highway Engineering- Nem Chand Bros, India.

REFERENCE BOOKS/OTHER READING MATERIAL

1. Ministry of Road Transport and Highways- Specifications for Roads and Bridge Works, Fifth Revision, IRC, New Delhi, India-2013.
2. IRC 37:2012- Guidelines for the Design of Flexible Pavements.
3. IRC 58:2015- Guidelines for the Design of Plain Jointed Rigid Pavements for Highways.
4. Highway Capacity Manual (2010), Transportation Research Board, USA
5. Indian Highway Capacity Manual (2017), Central road research institute, New Delhi.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 308	Environmental Engineering	C	3	0	0	3

UNIT I: WATER

Introduction: Water supply and demand, Population forecasts, Design period, Types of water demand, Factors affecting, fluctuations, fire demand, Water quality and testing, Drinking water standards, sources of water.

UNIT II: WATER TREATMENT

General outline of water treatment units, Screens – design, Sedimentation – principles, design factors, Coagulation-flocculation clarifier design, Coagulants, feeding arrangements.

Filtration – theory – working of slow and rapid gravity filters, Design of filters, Operational troubles, Disinfection – theory of chlorination, Chlorine demand and other disinfection, practices, Water softening methods, Design of distribution systems, pipe appurtenances.

Analysis of pipe networks.

UNIT III: SANITARY ENGINEERING

Characteristics of sewage, waste water collection, Estimation of wastewater and storm water, Design of sewers – shapes and materials, Sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks.

UNIT IV: OTHER POLLUTIONS AND THEIR IMPORTANCE

Module 1--

Air pollution – Composition and properties of air, quantification of air pollutants, Classification of air pollution– Effects of air pollution,

Global effects–Meteorological parameters affecting air pollution, Air quality standards

Atmospheric stability–Plume behavior

--Module 2—

  Noise pollution – Basic concept, Measurement and various control methods.

TEXT BOOKS

1. S.K. Garg, Water Supply Engineering: Environmental Engineering (Volume 1).
2. S.K. Garg, Environmental Engineering : Sewage Disposal and Air Pollution Engineering (Volume - 2).
3. Howard S. Peavy, Donald R. Rowe and George Tchobanoglous , Environmental Engineering.
4. B.C. Punmia and Ashok Kumar Jain, Wastewater Engineering (Including Air Pollution).

SEMESTER-V

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 309	Engineering Hydrology	C	3	0	0	3

UNIT I: INTRODUCTION

Introduction: Hydrologic cycle, Water-budget equation, Applications in engineering, Sources of data

Precipitation: Forms of precipitation, characteristics of precipitation in India,

Measurement of precipitation, rain gauge network

Mean precipitation over an area

Depth-Area-Duration relationships

Depth-Duration-Frequency relationships

Probable maximum precipitation and rainfall data in India

UNIT II: ABSTRACTIONS FROM PRECIPITATION

Evaporation process,

Evaporimeters, analytical methods of evaporation estimation,

Reservoir evaporation and methods for its reduction,

Evapotranspiration, measurement of evapotranspiration,

Evapotranspiration equations,

Potential evapotranspiration over India and actual evapotranspiration,

Interception, depression storage,

Infiltration, infiltration capacity, measurement of infiltration,

UNIT III: RUNOFF

Runoff volume, SCS-CN method of estimating runoff volume,

Flow duration curve, flow-mass curve, Hydrograph, factors affecting runoff hydrograph,

Components of hydrograph,

Base flow separation,

Effective rainfall,

Unit hydrograph – applications and limitations

Unit hydrograph from direct runoff hydrograph

S-Hydrograph

Surface water resources of India, environmental flows.

UNIT IV: GROUND WATER AND WELL HYDRAULICS

---Ground water hydrology---

Occurrence, movement and distribution of ground water

Aquifers – Types, specific yield, permeability, Darcy's law

---Well hydraulics---

Steady state flow in wells,

Equilibrium equations for confined and unconfined aquifers, aquifer tests,

Well constants

UNIT V: WATER REQUIREMENTS

Crop water requirements:

Water withdrawals and uses –water for energy production,

Water for agriculture,

Water for hydroelectric generation; flood control.

Analysis of surface water supply, Water requirement of Crops-Crops and crop seasons in India,

Cropping pattern, duty and delta;

Quality of irrigation water; Soil-water relationships, root zone soil water,

Infiltration, consumptive use, irrigation requirement, frequency of irrigation;

Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation

UNIT VI: DESIGN OF CANALS

Distribution systems -canal systems, alignment of canals, canal losses,

Estimation of design discharge.

Design of channels-rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels.

Lining of canals, types of lining

TEXTBOOKS

1. K. Subramanya, Hydrology (Tata Mc Graw Hill Education).
2. S. K. Garg, Irrigation engineering and hydraulic structures (Khanna publishers).
3. V.P. Singh, Elements of Engineering Hydrology (Tata Mc Graw Hill Education).
4. Jaya Rami Reddy,
5. K.N. Duggal and J.P. Soni, Elements of Water Resources Engineering (New age international)
6. K. Subramanya, Flow in open channels (Tata McGraw-Hill Education)

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 207 L	Transportation Engineering Lab	C	0	0	2	1

TESTS ON AGGREGATES
Aggregate crushing value test, Aggregate impact value test, Los Angele's abrasion test, Shape tests, Gradation of aggregate, Specific gravity test.

TESTS ON BITUMEN
Penetration test, Softening point test, Flash and fire point test, Ductility test, Viscosity test.

TRAFFIC STUDIES
Traffic Volume Counts, Traffic Turning Movement Counts, Traffic Spot Speed Study.

TESTS ON BITUMINOUS MIXES
Bituminous Mix Design, Proportioning of Aggregates, Proportioning of Aggregates, Bulk Density and Stability Flow tests, Binder Content Determination.

PAVEMENT DESIGN
Pavement Design, Soil CBR Test, Pavement Design (IRC 37 -2012)

TEXT BOOKS
1. Highway Materials And Pavement Testing by S. K. Khanna, C. E. G. Justo, A. Veeraragavan; Nem Chand & Bros.

REFERENCE BOOKS/OTHER READING MATERIAL
2. Bituminous Road Construction in India by Prithvi Singh Kandhal; PHI Learning; Revised edition (30 July 2016)
3. S. K. Khanna., C. E. G. Justo and A. Veeraragavan, Highway Engineering- Nem Chand Bros, India.
4. IRC 37:2012- Guidelines for the Design of Flexible Pavements.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ISES 301	Industry Specific Employability Skills V	HS	1	1	0	0

UNIT I: NUMBERS
Types and Properties of Numbers and Remainders, LCM, GCD, Fractions and decimals, Surds and Progressions.

UNIT II
Permutations, Combinations and Probability, Data Interpretation.

UNIT III
Geometry and Coordinate Geometry, Trigonometry and Mensuration.

UNIT IV: REASONING
Syllogism and Non-Verbal Reasoning, Analytical Reasoning.

TEXTBOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Arun Sharma – How to prepare for Quantitative Aptitude, Tata Mcgraw Hill.
2. R.S Agarwal, A Modern Approach to Verbal and Non Verbal Reasoning, S.Chand Publications.
3. Arun Sharma– How to Prepare for Data Interpretation & Logical Reasoning for the CAT.

SEMESTER-V

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CSE 333	Industry Standard Coding Practice - four	ES	0	0	4	1

UNIT I

Problem solving with - Descriptive statistics, Mean/median/mode, Measures of dispersion/range variance, deviations, mean/median/mode problems, Random variables, Univariate & Bivariate random variables.

UNIT II

Problem solving with - Graphs, Handshaking Lemma, Simple Graphs, DFS/BFS, Connected components, coloring, Introduction to DAGs, Spanning Trees, Articulation Points/ Connected points.

UNIT III

Problem solving with - Greedy Methods: Coin change, Fractional Knapsack, Activity Selections/ Job sequencing with Deadlines, Spanning Trees, Dynamic Programming: 0/1 Knapsack, Substructures, Longest common substring/subsequence, Longest Increasing sub sequence, Grid based Problems.

UNIT IV

Problem solving with - Divide & Conquer Strategies: Quick/Merge Sort, Min/Power functions, Backtracking, N Queens problem, Finding the path & Grid based problems, iterative/loop free approaches.

UNIT V

R Language Constructs, calculations, Operators, vectors, lists, Practice problems implementing R language, Matrices and data frame, Conditional statements and loops, Problem Solving on R language examples

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. An Introduction to Statistical Learning: with Applications in R - Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani.
2. Introduction to Algorithms by Thomas H. Corman, The MIT Press, 3rd Edition.
3. Introduction to Algorithms: A Creative Approach by Udi Mander, Pearson
4. R Cookbook - Paul Teetor, O'reilly.
5. Competitive Programming – 3e – Steven Halim, Felix Halim.

SEMESTER-VI

SEMESTER-VI

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 401	Design of Steel Structures	C	3	0	0	3

UNIT I: INTRODUCTION AND METHODS OF STRUCTURAL DESIGN

Mechanical behavior of steel – Measures of Yielding – Measures of Ductility, Types of Structures – Structural Steel Sections, Design Philosophies-Working Stress method- Ultimate Strength Method-Load and Resistant factor- Limit State Method-Partial safety factor-Load-Load Combinations-Classification of Cross sections- General aspects in the design.

UNIT II: DESIGN OF STEEL FASTENERS AND TENSION MEMBERS

Types of fasteners – Riveted connections- Bolted Connections-Assumptions- Failure of bolted joints - Strength of bolted joints – Design examples, Design of Welded connections – Butt weld- fillet weld – Design examples, Design of Tension Members: General-Modes of Failure of Tension member-Analysis of Tension members- Example - Design steps – Design examples – Lug angles – Design.

UNIT III: DESIGN OF COMPRESSION MEMBERS

General – Strength of Compression members- Design Compressive strength- Example on analysis of Compression members, Design of Angle struts – Design Examples- Built up Columns- Design of Lacing – Design of Battens- Design Examples- Design of Roof members.

UNIT IV: DESIGN OF BEAM AND COLUMN SPLICES

Design of Beams: General- Lateral Stability of Beams- Bending Strength of Beams –Plastic Section Modulus - Design Examples, Design of Beam Columns: Behaviour of members under combined loading – Modes of Failures – Design Examples, Design of Column Splices and Column Base: Design of Column Splice-Design Examples- Design of Column Base- Slab Base- Gusseted Base- Design Examples.

UNIT V: DESIGN OF ECCENTRIC CONNECTIONS AND PLATE GIRDER

Design of Eccentric Connections: Design of Brackets- Type-1 and Type 2 – Moment
Resistant connections - Design Examples, Design of Plate Girder: General- Components of Plate Girder- Optimum depth – Bending Strength – Shear Strength – Shear Buckling- Simple Post critical method- Tension Field method- Stiffeners-Bearing- Transverse stiffeners - Design Examples.

TEXTBOOKS

1. Limit State Design of Steel Structures – S.K.Duggal, TMH Education Pvt Ltd, 2nd Edition,2014.
2. IS-800-2007, BIS Publication.
3.Design of Steel structures – S.S. Bhavikatti, IK International Pub Pvt Ltd, 4th Edition.

REFERENCE BOOKS/OTHER READING MATERIAL

4. Mindess, Sidney., Young, J.F., Darwin, D., "Concrete", Pearson Education, 2003.

5. RCC Designs-B.C.Pummia, A.K.Jain and A.K.Jain, 10th edition Lakshmi Publications Ltd, New Delhi.

SEMESTER-VI

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 310	Estimation and Costing	C	3	0	0	3

UNIT I: ESTIMATION PROCEDURES

Procedure of estimating, Main items of work, Deduction for openings, Degree of accuracy, Arch Masonry Calculation.

UNIT II: BUILDING ESTIMATION

Individual wall method, Centre line method, Estimate of RCC slab, Estimate of RCC beam, RCC column with foundation, Estimate of earthwork – Buildings, Estimate of earthwork – Roads and Canals.

UNIT III: SPECIFICATIONS AND ANALYSIS OF RATES

Purpose and method of writing specifications, Detailed specifications (DS) for Brick work, DS for R.C.C. Plastering and Mosaic Flooring, DS for R.R Stone and Masonry, Preparing Analysis of rates for Concrete, Preparing Analysis of rates for RCC Works, Preparing Analysis of rates for Brick work in foundation and super structure, Preparing Analysis of rates for Plastering preparing lead statements.

UNIT IV: PWD ACCOUNTS AND PROCEDURE OF WORKS

Organization of Engineering department; Work charged establishment, Contract; Tender; Tender notice; Tender Schedule, Earnest money; Security money, Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area;Carpet area, Approximate Estimate; Plinth area estimate, Revised Estimate; Supplementary estimate,
Annual budgets of work, cash flow allocations yearly.

UNIT V: VALUATION AND CONTRACTS

TF Accounts of Materials USR Cost; Price & value, Methods of valuation; Out goings; Depreciation, Methods of valuation; Out goings; Depreciation, Methods of valuation; Out goings; Depreciation, Contract: types of contracts, Contract Law, EMD, Tenders, Acceptance of Contract, Branch of Contract.

TEXTBOOKS

1. Estimating and Costing in Civil Engineering (Theory & Practice) by B.N. Dutta; 28th Revised Edition or Latest; UBS Publishers' Distributors Ltd.
2. Estimating, Costing, Specification & Valuation in Civil Engineering by M. Chakraborti, 29th Revised Edition or Latest; S Chand Publishing House.

REFERENCE BOOKS/OTHER READING MATERIAL

3. Estimating, Costing, and Valuation [Professional Practice and Quantity Surveying] by Rangawala; 17th Edition or Latest; Charotar Publishing House Pvt. Ltd.
4. A Text Book of Estimating and Costing for Civil Engineering by G.S. Birdie; 6th Edition or Latest; Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi
5. A Textbook of Estimating, Costing & Accounts (Civil) by R.C. Kohli; 13th Revised Edition or Latest; S. Chand & Company Pvt. Ltd. New Delhi.

SEMESTER-VI

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 308 L	Environmental Engineering Lab	C	0	0	2	1

LIST OF PRACTICAL EXPERIMENTS

1. Determination of pH
2. Determination of acidity and alkalinity
3. Total solids in a water sample
4. Conductivity of a water sample
5. Determination of hardness of water
6. Determination of turbidity
7. Chlorine demand of water
8. Dissolved oxygen
9. Biological oxygen demand
10. Optimum dosage of alum using jar test
11. Chemical oxygen demand
12. Total coliforms (using multiple tube fermentation technique)
13. Air quality monitoring

TEXTBOOKS

1. S.K. Garg, Water Supply Engineering: Environmental Engineering (Volume 1).
2. S.K. Garg, Environmental Engineering : Sewage Disposal and Air Pollution Engineering (Volume - 2).
3. Howard S. Peavy, Donald R. Rowe and George Tchobanoglous , Environmental Engineering.
4. B.C. Punmia and Ashok Kumar Jain, Wastewater Engineering (Including Air Pollution).

REFERENCE BOOKS/OTHER READING MATERIAL:

1. MetCalf & Eddy, Wastewater Engineering Treatment and Reuse.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 303	Construction Engineering and Management	C	3	0	0	3

UNIT I: BASICS OF CONSTRUCTION

Definition, introduction and Basics of Construction, Unique features of construction, Construction projects types and features, Phases of a project, Agencies involved and their methods of execution.

UNIT II: CONSTRUCTION PROJECT PLANNING

Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, Co Role of client and contractor, Process of development of plans and schedules, hoI work break-down structure, activity lists, assessment of work content, concept of productivities, Ho estimating durations, sequence of activities and utility data; Techniques of planning- Bar charts, Gantt Charts, Co Networks: the terminology, types, relationships, preparation of CPM networks: PERT analysis.

UNIT III: CONSTRUCTION METHODS BASICS

The Types of foundations and construction methods; Basics of Formwork and Staging;
Common building construction methods, Modular construction methods for repetitive works, Uti Precast concrete construction methods, Ut Basic construction methods for steel structures; Basics of construction methods for Bridges.

UNIT IV: CONSTRUCTION EQUIPMENT BASICS

Conventional construction methods Vs Mechanized methods and advantages, Equipment for Earthmoving, Dewatering, Equipment for Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities.

UNIT V: PLANNING AND ORGANIZING CONSTRUCTION SITE AND RESOURCES

site layout including enabling structures, developing site organization, Documentation at site, Manpower: planning, organizing, staffing, motivation, Materials: concepts of planning, procurement and inventory control, Pe Equipment: basic concepts of planning and organizing, Funds: cash flow, sources of funds; Histograms and S-Curves. Earned Value, Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and levelling. Common Good Practices in Construction.

UNIT VI: PROJECT MONITORING & CONTROL

Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans, B Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM), Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality

control, Dd Safety, Health and Environment on project sites: accidents; their causes, effects and its preventive measures.

UNIT VII: CONTRACTS MANAGEMENT BASICS

Importance of contracts; Types of Contracts, parties to a contract, Gg Common contract clauses (Notice to proceed, rights and duties, Dd Contract Duration and Price, Dd Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Dd Dispute Resolution methods. Acts and Rules.

UNIT VIII: CONSTRUCTION COSTS.

Dd Make-up of construction costs; Dd Classification of costs, Dd Time cost trade-off in construction projects, compression and decompression.

TEXTBOOKS/REFERENCE BOOKS/OTHER READING MATERIAL

1. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
2. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
3. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
4. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.
5. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
6. Chudley, R., Construction Technology, ELBS Publishers, 2007.
7. 7.National Building Code, Bureau of Indian Standards, New Delhi, 2017.

SEMESTER-VI

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
ISES 302	Industry Specific Employability Skills VI	HS	1	1	0	0

UNIT I
Antonyms, synonyms, odd words, Idioms and phrasal verbs, same word with different part of speech, Word analogy. Sentence completion.

UNIT II
Text completion, Sentence equivalence, Introduction to Different Parts of an Argument in Reasoning, Assumption of an Argument, strengthening of an Argument, Weakening of an argument.

UNIT III
Para jumbles, Sentence Completion & Text Completion, Reading Comprehension, Identification of errors, Sentence correction, Resume writing, Cover letter.

UNIT IV
GD, PI

TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1. Verbal Ability and Reading comprehension-Sharma and Upadhyay.
2. Charles Harrington Elstor, Verbal Advantage: Ten Easy Steps to a Powerful Vocabulary, Large Print, September 2000.
3. GRE Word List 3861 – GRE Words for High Verbal Score, 2016 Edition.
4. The Official Guide to the GRE-General Revised Test, 2nd Edition, Mc Graw Hill Publication.
5. Soft Skills Training: A Workbook to Develop Skills for Employment Book by Frederick H. Wentz.
6. The Resume Writing Guide: A Step-by-Step Workbook for Writing ...Book by Lisa McGrimmon.

SEMESTER-VII

SEMESTER-VIII

SEMESTER-VIII

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 502	Capstone Project	PR	0	0	24	12

Capstone Project Guidelines

Introduction

These guidelines are conceived as a set of procedures stating broad expectations from both students and mentors of the Capstone project which is part of the B.Tech EEE curriculum. These guidelines are intended to make the project work evaluation process easier, formal and more authentic. The Capstone Project is in 8th semester. The total number of credits offered for the capstone project is 12. The Capstone project has to be sufficiently complex and feasible so as to be considered for 12 credits. The evaluation of the project is done by a review panel comprising department faculty members and the review process is continuous. In the first review by the constituted panel, the project may be accepted or rejected or major/minor changes can be suggested.

Project Selection

Capstone project may be an in-campus project or can be mapped with internship carried out in the industry or the research internship carried out in the other premier Universities in India/Abroad.

In campus project: The idea for student's Project may be a proposal from a faculty member or student's own, or perhaps a combination of the two. The project has to be sufficiently complex and feasible. Students are advised to choose a project that involves a combination of sound background research, a solid implementation, or piece of theoretical work, and a thorough evaluation of the Project's output. Interdisciplinary Project proposals and innovative Projects are encouraged and more appreciable.

Mapping with any Internship:

1. Any type of internships can be carried out by the students in the 8th semester after getting the due approval from the Project coordinator and the Head of the department.
2. The internship period has to be a minimum of 10 weeks of duration in the semester and the students could have carried out the practical work for at least 180 hrs during this period.
3. The internship has to involve some Software/Hardware design and implementation component and/or research component and the complexity of this work is expected to match the requirements of Capstone Project work.

Mentor allocation process: Students can form a batch of 4 (5 may be allowed in exceptional cases on the discretion of the project coordinators) and select their mentor provided the Faculty member accepts them and the faculty member has less than the specified number projects under his/her mentorship.

Project Equipment: In case of deserving projects for limited financing of equipment, the students can approach the concerned university authorities following due procedure.

Meetings with Your Supervisor:
Instructions to students: You must make sure that you arrange regular meetings with your Mentor. The meetings may be brief once your project is under way, but your Mentor needs to know that your

work is progressing. You are also expected to be contactable throughout the project. You should inform the Mentor your contact details and keep these updated if these change.

Instructions to Mentors: Mentors are advised to maintain a project dairy depicting attendance of student and progress of project.

Legal and Ethical Considerations: If a student want to do some project with some company where their relatives or friends work, the details need to be disclosed to their mentor. The mentor has to report the same to the project coordinators for permission. Again, if a student doing internship with a company, the data, procedures/algorithms and software developed may be classified and may not be allowed to submit in the report. The students need to consider that before requesting mapping.

Project Report format: Format of the report is similar to the format of standard Journal papers published. (Abstract-Literature survey-Methodology-Algorithms-Simulation-Results-explanation of results-Future work etc)

Project milestones and Assessment
Starting date of the project to be taken as the commencement date of 8th semester. A student is expected to finish the project in the same semester. The students are expected to plan from the beginning for at least one research publication in a reputed journal.

8th Semester:

Stage 1: Title, Scope of the project and Literature survey to be submitted within 2 weeks from the commencement of the project. In the first review by the constituted panel, the project may be accepted or rejected or major/minor changes can be suggested.

Stage 2: Methodology, Requirement analysis and Deliverables to be submitted within 6 weeks from the commencement of the project.

Stage 3: Project design and implementation plan have to be submitted within 8 weeks of the commencement of the 8th semester. Internal review will be conducted by the Mentor and this review has a weightage of 50%.

Stage 4: Project (Software/Hardware) implementation to be done and demonstrate that the project meets the requirements and expectations.

Stage 5: The results need to be analyzed and if any fine tuning required is to be done.

Final evaluation: by expert committee at the end of the 10th week and this evaluation has a weightage of 50%.

TECHNICAL ELECTIVES

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 402	Advanced Environmental Engineering	TE	3	0	0	3

UNIT I: INTRODUCTION

Introduction: Wastewater Characteristics, Standards of disposal, Treatment objectives and Strategies, Layouts of Primary, Secondary and Advanced Treatment Units. Wastewater quality parameters.

UNIT II: DESIGN OF PRIMARY TREATMENT OPERATIONS

Design of preliminary and primary treatment operations: Screens, Grit Chambers, Skimming Tank, Primary and Secondary Sedimentation Tanks.

UNIT III: BIOLOGICAL TREATMENT PROCESSES

Objectives — Selection of Treatment Methods — Principles, Functions, Types, Attached Growth Processes: Trickling Filters (Standard Rate, High Rate), Biofilters, Practices, Features and Design, Operational Difficulties and Remedial Measures, Rotating Biological Contactors. Activated Sludge Process, Design Criteria, Oxygen and Nutrient Requirements -Classification and Design of Oxidation Ponds, Lagoons.

UNIT IV: SLUDGE TREATMENT AND DISPOSAL

Sludge Treatment and Disposal: Sludge Thickening, Aerobic and Anaerobic Sludge Digestion Processes Sludge Dewatering, Ultimate Disposal, Sludge Drying Beds, Other Methods of Sludge Treatment.

TEXTBOOKS

1. S.K. Garg, Environmental Engineering: Sewage Disposal and Air Pollution Engineering (Volume - 2)
2. Howard S. Peavy, Donald R. Rowe and George Tchobanoglous , Environmental Engineering.
3. B.C. Punmia and Ashok Kumar Jain, Wastewater Engineering (Including Air Pollution).
4. Wastewater Treatment –Concepts and Design Approach, by G L Karia and R A Christian, Prentice Hall of India, 2006.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 403	Advanced Pavement Engineering	TE	3	0	0	3

UNIT I: PAVEMENT EVALUATION

Functional and Structural Evaluation – Intro, Functional evaluations - Merlin, Bump Integrator, Functional evaluations - Merlin, Bump Integrator, Pavement Distress Surveys – Flexible, Pavement Distress Surveys – Rigid, Automatic Distress Surveys - Network Survey Vehicles (NSV), Structural Evaluation – Benkleman Beam Deflectometer (BBD) and overlay design, Falling Weight Deflectometer (FWD).

UNIT II: PAVEMENT MANAGEMENT SYSTEMS (PMS)

Pavement Condition Index (PCI), Pavement asset management principles, Maintenance and rehabilitation treatments, Introduction to PMS Decision Trees, Life Cycle Cost Analysis, Cost/Benefit Ratio.

UNIT III: ADVANCES IN PAVEMENT MATERIAL CHARACTERIZATION

HMA Volumetric Relationships, Superpave Mix Design, Performance Testing – HMA Dynamic Modulus, Aggregate and Soil Resilient Modulus, Bitumen Dynamic Shear Rheometer (DSR).

UNIT IV: ADVANCES IN PAVEMENT DESIGN PRACTICES

AASHTO 1993 Design Method, PaveXpress Software – Tutorial, AAHSTOWare Pavement ME Design (PMED).

UNIT V: SUSTAINABLE PAVEMENT MATERIALS AND METHODS

Recycled Asphalt Pavement Technology, Cold Mix and Warm Asphalt Technology, Porous Asphalt Pavement Technology, Rubber and Waste Plastic Road Technology.

TEXT BOOKS

1. Yang H. Huang, Pavement Analysis and Design, 2nd edition, Pearson Education, India
2. Partha Chakraborty and Animesh Das, Principles of Transportation Engineering, Prentice Hall India.
3. Rajib B. Mallick, and Tahar El-Korchi, Pavement Engineering Principles and Practice, Third Edition, CRC Press.
4. M. Rashad Islam and Rafiqul A. Tarefder, Pavement Design: Materials, Analysis, And Highways, McGrawHill Publishers.
5. M.Y. Shahin, Pavement Management for Airports, Roads, and Parking Lots, 2nd Edition, Springer.

REFERENCE BOOKS/OTHER READING MATERIAL

6. Athanassios Nikolaides, Highway Engineering: Pavements, Materials and Control of Quality, 1st Edition, CRC Press
7. E. Ray Brown, Hot Mix Asphalt Materials, Mixture Design and Construction, 3rd Edition, NAPA Publications, USA
8. Asphalt Institute, MS-4 The Asphalt Handbook, 7th Edition, ISBN: 9781934154274, USA.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 404	Introduction to Structural Dynamics	TE	3	0	0	3

UNIT I

Dynamics of Structures: Objectives and importance. Types of dynamic loads, Dynamic degree of freedom, Mathematical modeling, Damping and stiffness, Torsional stiffness, Equivalent stiffness, Free and forced vibrations.

UNIT II

Single Degree of Freedom (SDOF) Systems: Undamped free vibrations, formulation of differential equation of motion: Newton's law of motion, D'Alembert's principle and energy approach. Natural frequency. Vibration response.

UNIT III

Single Degree of Freedom (SDOF) Systems: damped free vibrations, critically damped, under damped & over damped systems, formulation of differential equation of motion: Natural frequency. Vibration response.

UNIT IV

Forced vibration response of SDOF damped and undamped systems to harmonic loading, rotating and reciprocating unbalance, support motion and impulsive type forcing function. Vibration isolation and transmissibility. Seismic Instruments.

UNIT V

Vibrations of two degree of freedom systems, matrix formulation of equations of motion, principal modes of vibrations. Extension of the concept to MDOF systems. Introduction to Rayleigh's principle, modal analysis.

TEXT BOOKS/REFERENCE BOOKS
1. K. Chopra – Dynamics of Structures: Theory and applications to earthquake engineering, Prentice Hall of India
2. W.T. Thomson – Theory of Vibrations - Kluwer Academic Pub
3. Mario Paz, William Leigh - Structural Dynamics -Theory and Computation

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 432	Railway and Airport Engineering	TE	3	0	0	3

UNIT I: RAILWAY ENGINEERING 1
Historical development of railways in India – Advantages of Railways – Classification of Indian Railways, Permanent way – Components and their functions, Rail joints –Welding of Rails, Creep of Rails, Rail fixtures & Fastenings.

UNIT II: RAILWAY ENGINEERING 2
Track Geometric design – Points & Crossings, Track drainage, Layout of Railway stations and yards, Signals – Interlocking, Track circuiting, . Track Maintenance.

UNIT III: AIRPORT ENGINEERING 1
Factors affecting Selection of site for Airport, Aircraft Characteristics, Geometric Design of Runway, Computation of Runway length, Correction for runway length, Orientation of Runway, Wind Rose Diagram, Runway Lighting system.

UNIT IV: AIRPORT ENGINEERING 2
Airport Pavements – types and importance 2, Structural design – Asphalt mix pavements 2, Design of concrete pavements, Nondestructive testing and rehabilitation, Maintenance – Airport Pavements.

UNIT V: TUNNEL ENGINEERING
Alignment of tunnels – Cross-section of tunnels, Construction methods of Tunnels, Tunnel lining – Ventilation, Drainage – Muck disposal.

TEXT BOOKS
1. A Text Book of Railway Engineering by S.C. Saxena & S. Arora. Dhanpat Rai Publications (p) Ltd., New Delhi
2. Airport Planning and Design by S.K.Khanna and Arora; Nem Chand Bros
3. Pavement Engineering: Principles and Practice by Mallick & El-Korchi, CRC Press
4. Railway, Bridge, and Tunnel Engineering by Ketki B. Dalal (K.S. Rangwala); 2nd Edition or Latest; Charotar Publishing House Pvt. Ltd.

REFERENCE BOOKS/OTHER READING MATERIAL
5. Railway Engineering by Satish Chandra and M.M. Agarwal; 2nd edition; Oxford Publishing.
6. Airport Engineering by Rangwala; 14th Edition or latest; Charotar Publishing House Pvt. Ltd.
7. Dock & Harbour Engineering by Ozha & Ozha; 7th edition; Charotar Publishing House Pvt. Ltd.
8. Transportation Engineering: Volume II: Railways, Airports, Docks and Harbours, Bridges and Tunnels by C Venkatramaiah; Orient Blackswan Private Limited.

OPEN ELECTIVES

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 203	Strength of Materials	OE	3	0	0	3

UNIT I: SIMPLE STRESSES AND STRAINS

Introduction, Basic concepts, Simple stresses and strains; Elasticity and plasticity; Types of stresses and strains; Hooke's law; Stress-strain diagrams, Working stress; Factor of safety; Lateral strain; Volumetric strain and Poisson's ratio; Elastic moduli; Elastic constants for isotropic materials, Statically determinate and indeterminate problems, Bars of varying section–composite bars; Temperature stresses, Strain energy; Resilience – Gradual, sudden, impact and shock loadings.

UNIT II: SHEAR FORCE AND BENDING MOMENT

Introduction to types of beams, supports and loadings; Shear force and bending moment, Cantilever, simply supported and overhanging beams subjected to point loads, UDL, uniformly varying loads and combination of these loads, Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam, Couple and their combinations.

UNIT III: FLEXURAL STRESSES

Theory of simple bending and assumptions, Derivation of bending equation: $M/I = f/y$ E/R, Neutral axis; Determination bending stresses, Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections.

UNIT IV: SHEAR STRESSES

Derivation of formula; Shear stress distribution, rectangular, circular, triangular, I, T angle sections, built up beams, shear center.

UNIT V: TORSION IN CIRCULAR SHAFTS

Introduction; Pure torsion; Assumptions; derivation of torsion equation for circular shafts, torsional rigidity and polar modulus, power transmitted by a shaft, power transmitted by a shaft.

TEXTBOOKS

1. Strength of materials, S. Ramamrutham and R. Narayanan, Dhanpat Rai publishers.
2. A textbook of strength of materials, R. K. Bansal, 5th Ed., Laxmi publications.
3. Strength of materials, B. C. Punmia, Ashok K. Jain and Arun K. Jain, Laxmi publications.

REFERENCE BOOKS

1. Elements of strength of materials, S. P. Timoshenko and D. H. Young, 5th Ed., East-West press.
2. Mechanics of materials, Ferdinand P. Beer, E. Russell Johnston and Jr. John T. DeWolf, 3rd Ed., Tata McGraw-Hill.

3. Mechanics of materials, Russel C. Hibbeler, 9th Ed., Pearson publications.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 203	Strength of Materials	OE	3	0	0	3

UNIT I: SIMPLE STRESSES AND STRAINS

Introduction, Basic concepts, Simple stresses and strains; Elasticity and plasticity; Types of stresses and strains; Hooke's law; Stress-strain diagrams, Working stress; Factor of safety; Lateral strain; Volumetric strain and Poisson's ratio; Elastic moduli; Elastic constants for isotropic materials, Statically determinate and indeterminate problems, Bars of varying section–composite bars; Temperature stresses, Strain energy; Resilience – Gradual, sudden, impact and shock loadings.

UNIT II: SHEAR FORCE AND BENDING MOMENT

Introduction to types of beams, supports and loadings; Shear force and bending moment, Cantilever, simply supported and overhanging beams subjected to point loads, UDL, uniformly varying loads and combination of these loads, Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam, Couple and their combinations.

UNIT III: FLEXURAL STRESSES

Theory of simple bending and assumptions, Derivation of bending equation: $M/I = f/y$ E/R, Neutral axis; Determination bending stresses, Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections.

UNIT IV: SHEAR STRESSES

Derivation of formula; Shear stress distribution, rectangular, circular, triangular, I, T angle sections, built up beams, shear center.

UNIT V: TORSION IN CIRCULAR SHAFTS

Introduction; Pure torsion; Assumptions; derivation of torsion equation for circular shafts, torsional rigidity and polar modulus, power transmitted by a shaft, power transmitted by a shaft.

TEXTBOOKS

1. Strength of materials, S. Ramamrutham and R. Narayanan, Dhanpat Rai publishers.
2. A textbook of strength of materials, R. K. Bansal, 5th Ed., Laxmi publications.
3. Strength of materials, B. C. Punmia, Ashok K. Jain and Arun K. Jain, Laxmi publications.

REFERENCE BOOKS

1. Elements of strength of materials, S. P. Timoshenko and D. H. Young, 5th Ed., East-West press.

2. Mechanics of materials, Ferdinand P. Beer, E. Russell Johnston and Jr. John T. DeWolf, 3rd Ed., Tata McGraw-Hill.
3. Mechanics of materials, Russel C. Hibbeler, 9th Ed., Pearson publications.

COURSE CODE	COURSE NAME	COURSE CATEGORY	CREDITS			
			L	T	P	C
CE 408	Construction Materials	OE	3	0	0	3

UNIT I: OVERVIEW OF CONCRETE AND CONSTRUCTION MATERIALS

Nature and advantages of concrete, Overview of various construction materials, Overview of Cement, Overview of fine and coarse aggregates, Properties of water, Role of chemical and mineral admixtures.

UNIT II: CEMENT

Manufacture and composition of cement, Modified portland cements, Specifications and tests for portland cements, Chemistry of hydration, Properties of hydration products, Microstructure and properties of hydrated cement paste, Blended cements, fly ash and slag, Effect of fly ash and slag on properties of fresh and hardened concrete.

UNIT III: WATER, AGGREGATES AND ADMIXTURE

Water quality, classifications and properties of aggregates, nonstandard aggregates **,** use of chemical admixture, water reducing admixture, admixture for set control.

UNIT IV: PROPERTIES OF CONCRETE, CURING CONDITIONS AND MIX DESIGN

Workability and properties of fresh concrete, Factors influencing workability, setting of concrete and tests for fresh concrete, Finishing of concrete and role of curing temperature, Tests for compressive strength, Quality assessment of concrete and other methodologies, Fundamentals of mix design, Mix design as per BIS Method.

UNIT V: DURABILITY AND SPECIAL CONCRETES

Permeability of concrete, Physical attack, Chemical attack-carbonation, Sulphate attack and chloride attack, High strength concrete, Self-compacting concretes, Lightweight concretes and other concretes.

TEXT BOOKS

1. Shetty, M. S., and Jain, A K., "Concrete Technology: Theory and Practice", 8th Edition, S,chand publications., New Delhi, 2019.
2. Nevelli, A.M., "Properties of Concrete", – 5th Ed, Prentice Hall Publishers, 2012.
3. Gambhir, M.L., "Concrete Technology", Tata Mc Graw Hill Publishers – 2012.

REFERENCE BOOKS/OTHER READING MATERIAL

1. Mindess, Sidney., Young, J.F., Darwin, D., "Concrete", Pearson Education, 2003.