Academic Scheme for
B.Tech Civil Engineering
Four Years Programme

Syllabus

As per

(Choice Based Credit System)
Of
Department of Civil Engineering
IUST

(I – VIII Semesters- for Batch 2018 & onwards)

Department of Civil Engineering IUST

Awantipora, Pulwama -192122

COUURSE STRUCTURE FOR B.TECH CIVIL ENGINEERING
(2018 & ONWARDS)

Semester-I **First Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	PHY101C	Physics	3	1	0	60	4
2.	CHM101C	Chemistry	3	1	0	60	4
3.	MTH103C	Mathematics-I	2	1	0	45	3
4.	BIO101C	Environmental Science	3	0	0	45	3
5.	MEC101C	Engineering Graphics and Design	1	0	6	60	4
6.	ENG101C	Communication Skills	2	0	2	45	3
Total Credits							21

Semester-II **First Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV150C	Engineering Mechanics	3	1	0	60	3
2.	MTH153C	Mathematics-II	3	1	0	60	4
3.	CSE150C	Programming for Problem Solving	2	1	0	45	3
4.	MEC150C	Workshop Practices	0	0	4	45	3
5.	ELE150C	Basic Electrical Engineering	2	1	0	45	3
6.	CSE151C	Programming Lab	0	0	2	15	1
7.	PHY150C	Physics Lab	0	0	2	15	1
8.	CHM150C	Chemistry Lab	0	0	2	15	1
Total Credits							19

Semester-III **Second Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-311T	Structural Analysis I	3	1	0	60	4
2.	CIV-312T	Surveying Measurements & Adjustments	2	1	0	45	3
3.	CIV-313T	Fluid Mechanics I	2	1	0	45	3
4.	CIV-314T	Building Materials & Construction	2	1	0	45	3
5.	MTH-312T	Probability & Statistics	2	0	0	30	2
6.	CIV-315P	SOM Lab	0	0	2	15	1
7.	CIV-316P	Surveying Measurements & Adjustments Lab	0	0	2	15	1
8.	CIV-317P	Fluid Mechanics Lab I	0	0	2	15	1
9.	YYY-yyyT	Open Elective	*	*	*	30	2
10.	XXX-xxxTP	Generic Elective (SOT)	*	*	*	30	2
						Total Credits	22

Semester-IV **Second Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-411T	Structural Analysis II	3	1	0	60	4
2.	CIV-412T	Advanced Surveying Measurements	2	1	0	45	3
3.	CIV-413T	Fluid Mechanics II	2	1	0	45	3
4.	CIV-414T	Concrete Technology	2	1	0	45	3
5.	CIV-415T	Building Drawing & AUTOCAD	0	1	4	45	3
6.	MTH-412T	Numerical Methods	2	0	0	30	2
7.	CIV-416P	Concrete Technology Lab	0	0	2	15	1
8.	CIV-417P	Fluid Mechanics Lab II	0	0	2	15	1
9.	CIV-418P	Advanced Surveying Measurements Lab	0	0	2	15	1
10.	CIV-419P	Structure Lab	0	0	2	15	1
11.	CIV-410P	Survey Camp	0	0	2	15	1
						Total Credits	23

Semester-V **Third Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-511T	Design Of Concrete Structures-I	2	1	0	45	3
2.	CIV-512T	Geotechnical Engineering-I	2	1	0	45	3
3.	CIV-513T	Water Supply Engineering	2	1	0	45	3
4.	CIV-514T	Quantity Survey & Cost Estimation	2	1	0	45	3
5.	CIV-515T	Structural Analysis III	2	1	0	45	3
6.	CIV-516T	Construction Technology and Management	2	0	0	45	2
7.	CIV-517P	Geotechnical Lab I	0	0	2	15	1
8.	CIV-518P	Water Quality Lab	0	0	2	15	1
9.	YYY-yyyT	Open Elective	*	*	*	30	2
						Total Credits	21

Semester-VI **Third Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-611T	Design Of Steel Structures-I	2	1	0	45	3
2.	CIV-612T	Geotechnical Engineering-II	2	1	0	45	3
3.	CIV-613T	Transportation Engineering-I	2	1	0	45	3
4.	CIV-614T	Engineering Hydrology	2	1	0	45	3
5.	CIV-615T	Engineering Geology & Seismology	2	1	0	45	3
6.	XXX-xxxT	Elective I(DC)	2	0	0	30	2
7.	CIV-616P	Geotechnical Lab II	0	0	2	15	1
8.	CIV-617P	Transportation Lab	0	0	2	15	1
9.	CIV-618P	Engineering Geology Lab	0	0	2	15	1
10.	CIV-619P	Tour and Training	0	0	2	15	1
11.	YYY-yyyT	Open Elective	*	*	*	30	2
						Total Credits	23

Semester-VII **Fourth Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-711T	Design Of Concrete Structures-II	2	1	0	45	3
2.	CIV-712T	Irrigation & Hydraulic Structures	2	1	0	45	3
3.	CIV-713T	Waste Water Engineering	2	1	0	45	3
4.	CIV-714T	Railway and Airport Engineering	2	1	0	45	3
5.	XXX-xxxT	Elective II(DC)	2	0	0	30	2
6.	XXX-xxxT	Elective III(DC)	2	0	0	30	2
7.	YYY-yyyT	Open Elective	*	*	*	30	2
8.	CIV-715P	Pre Project	0	0	4	30	2
9.	CIV-716P	Seminar	0	0	2	15	1
						Total Credits	21

Semester-VIII **Fourth Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-811T	Design Of Bridge Structures	2	1	0	45	3
2.	CIV-812P	Project	0	0	16	90	8
5.	XXX-xxxT	Elective IV (DC)	2	0	0	30	2
						Total Credits	13

TOTAL CREDITS = 163

Electives	Credits
Open Elective	**8**
Generic Elective	**2**
Elective (DC)	**8**

NOTE:

1. In case of Departmental centric (DC) Electives, the student has to opt between the choices in the electives provided by the Department of Civil Engineering.

2. In case of Generic Elective floated at III Semester level the students have to opt between the Electives circulated for them within the Departments of School of Engineering and Technology.

3. In case of Open Electives, the students will have to register for any course floated as Open Electives by any Department within the University.

4.Definition of Credit:

1 hr. Lecture (L) per week	1 credit
1 hr. Tutorial (T) per week	1 credit
1 hr. Practical (P) per week	0.5 credit
2 hrs. Practical (P) per week	1 credit

5. Range of Credits:

Credits earned in the range of 163 and above shall be required for a student to be eligible to get Under Graduate Degree in Civil Engineering. A student will be eligible to get Under Graduate Degree with Honours or additional Minor Engineering, if he/she completes an additional 20 credits. These could also be acquired through MOOCs.

List of Discipline Centric Electives

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits	Preferred Semester
			L	T	P			
1.	CIV-E01T (Elective I)	Architecture & Town Planning	2	0	0	30	2	VI
2.	CIV-E02T (Elective I)	Geo-Environmental Engineering	2	0	0	30	2	VI
3.	CIV-EO3T (Elective II)	Advanced Structural Analysis	2	0	0	30	2	VII
4.	CIV-EO4T (Elective II)	Structural Dynamics	2	0	0	30	2	VII
5.	CIV-E05T (Elective III)	Transportation Planning and Economics	2	0	0	30	2	VII
6.	MTH-E01T (Elective III)	Operation Research & Optimisation	2	0	0	30	2	VII
7.	CIV-EO6T (Elective III)	Hydropower Engineering	2	0	0	30	2	VII
8.	CIV-EO7T (Elective IV)	Earthquake Resistant Design	2	0	0	30	2	VIII
9.	CIV-E08T (Elective IV)	Pre-stressed Concrete	2	0	0	30	2	VIII

Final Vetted Course Structure for B. Tech. (First Year), 2018 Onwards

Semester-I **First Year**

S. No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	PHY101C	Physics	4	0	0	4	4
2.	CHM101C	Chemistry	4	0	0	4	4
3.	MTH103C	Mathematics-I	3	0	0	3	3
4.	BIO101C	Environmental Science	3	0	0	3	3
5.	MEC101C	Engineering Graphics and Design	2	0	4	6	4
6.	ENG101C	Communication Skills	2	0	2	4	3
						Total Credits	21

Semester-II **First Year**

S. No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV150C	Engineering Mechanics	3	0	0	3	3
2.	MTH153C	Mathematics –II	4	0	0	4	4
3.	CSE150C	Programming for Problem Solving	3	0	0	3	3
4.	MEC150C	Workshop Practices	1	0	4	5	3
5.	ELE150C	Basic Electrical Engineering	3	0	0	3	3
6.	CSE151C	Programming Lab	0	0	2	2	1
7.	PHY150C	Physics Lab	0	0	2	2	1
8.	CHM150C	Chemistry Lab	0	0	2	2	1
						Total Credits	19

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PHY101C **Physics** **4-0-0**

Vectors: Vector Analysis, Rotation of coordinate axis and Transformation of vectors, Gradient of scalar field, divergence and curl of vector field in Cartesians, Spherical polar and Cylindrical Coordinate systems, line , surface & volume integrals, Gauss's divergence theorem, Stokes's theorem.

Mechanics: Newton's laws of motion**,** rigid body, centre of mass, conservation of linear momentum, moment of inertia, conservation of angular momemtum, Central forces, Keplers laws for planetary motion. SHM, Damped, undamped and forced Oscillations (no derivation): Equation of motion, solution, amplitude resonance, velocity resonance, quality factor.

Special theory of Relativity: Frame of reference, Michelson-Morley experiment, Galilian transformations, basic postulates of special relativity, Lorentz transformations, length contraction and time dilation, mass energy relation.

Optics: Electromagnetic theory of light, Interference**:** Conditions for Interference of light, Youngs double slit experiment, Newton's rings , diffraction**:** Single Slit diffraction pattern, Diffraction grating, Grating spectra, Polarization: Malus Law, Phenomena of double refraction.
Lasers: Properties of laser light**,** Main components of laser, absorption, spontaneous and stimulated emmission, CW and pulsed lasers, Examples and applications: He-Ne laser, Ruby laser.

Quantum Theory: Need of Quantum theory, Photoelectric effect, Compton effect, Heisenberg's uncertainty principle, de Broglie's hypothesis. Basic postulates of quantum mechanics, Wave function and its properties, Schrodinger's equation and its application to particle in 1-D box.
Nuclear physics: Structure of nucleus. Basic properties of nucleus (size, charge, density), Binding energy, Nuclear fission & fusion, Radioactivity, Gas detectors: GM counter.

Elementary Solid State Physics: Crystal lattice, Crystal structure, Unit cells, Miller Indices, Bravais lattice, Bragg's Law, Photographic crystal X-ray diffraction techniques, Laue's method. Free electron theory of metals, Classification of solids, formation of energy bands in metals, semiconductors and insulators, intrinsic and extrinsic semiconductors.

Text Books/Reference Books:

1. Griffiths D. J., Introduction to electrodynamics, *Pearson Education (India).*
2. Murray R. Speigel, Schaum's Outline on Vector Analysis, *McGraw Hill Education India.*
3. Upadhaya J. C., Classical Mechanics, *Himalaya Publishing House.*
4. Ghatak A., Optics, *McGraw Hill Education India.*
5. Besier A., Mahajan S., Choudhary S. R., Concepts of Modern Physics, *McGraw Hill Education India.*
6. Omar M. A., Elementary Solid State Physics, *Prentice Hall of India.*

CHM101C **Chemistry** **4-0-0**

Chemical Thermodynamics: Introduction and Importance, First Law of Thermodynamics, Work done in Isothermal and Adiabatic Conditions, Heat capacities, Relation between C_p and C_v relations, Second Law of Thermodynamics, Concept of Entropy, Carnot engine, Gibbs free energy. Free Energy Changes as Criteria of Reversible and Irreversible process, Gibbs-Helmholtz's equation, Clausius–Clapeyron equation

Electro-Chemistry and Corrosion: Introduction, Conductivity of Electrolytes, Kohlrausch's Law of Independent Migration of Ions and its Application, Debye Huckel Theory of Strong Electrolytes. Electrochemical cells, Electrode-Potential, Standard Electrode Potential, Fuel Cells, Batteries, Introduction, Effects of Corrosion, Dry Corrosion and Wet Corrosion, mechanisms, Types of Corrosion (Pitting Corrosion, Crevice Corrosion, Galvanic Corrosion and Stress corrosion), Factors Effecting Corrosion (Nature of the Metal and Nature of the Environment), Corrosion Protection and Inhibition (Cathodic Protection, Anodic Protection, Protective Coatings)

Nano-Technolgy and Polymers: Nanoscale and Its Significance, Properties at Nanoscale: Optical, Electrical, and Magnetic. General Methods of Preparation of Nanomaterials viz Top Down (Ball Milling, Lithography) and Bottom up Methods (Sol-Gel, Solution Based Method), Advantages of Polymers over other Engineering Materials, Functionality, Degree of Polymerization, Concept of Molecular Weight, Polymerization (Addition, Condensation and Copolymerization), Polymerization Techniques (Bulk, Solution, Suspension and Emulsion polymerizations), Preparation, Properties and Engineering application of some Important Polymers, Polythene (LDPE and HDPE), Polyvinyl Chloride, Polystyrene, Teflon, Phenol Formaldehyde, urea-formaldehyde resin

Lubricants: Introduction, Function of Lubricants, Mechanism of Lubrication, Classification of Lubricants (Liquid, Semisolid, Solid), Properties of Lubricants (Flash Point and Fire Point, Viscosity , Aniline Point Acid value)

Instrumental Techniques: Introduction, Advantages and Disadvantages of Instrumental and Non-Instrumental Methods, Electromagnetic Radiation, Electromagnetic Spectrum, Light Absorption (Beers-Lambert Law) UV-Vis spectroscopy (Types of Transition, Chromophors, Auxo-chromes and Applications), Infrared Spectroscopy (Modes of vibration, IR bands corresponding to different functional groups and Applications), Nuclear Magnetic Resonance: Principle, shielding mechanism, chemical shift, number of Signals, Application of Nuclear Magnetic Resonance to Simple Organic Molecules.

Text Books/Reference Books:

1. Chemistry in Engineering and Technology Volumes I & II, J. Kuriacose, R. Rajaram, 2001, TMH publishing company Limited, New Delhi.
2. Engineering Chemistry, P.C. Jain, 16th Edition, Dhanpat Rai & Sons, Nai Sarak; New Delhi.
3. Chemistry of Engineering Materials, C.V. Agarwal, 9th Edition.
4. Chemistry in Engineering, L. A. Munro, 1964, Prentice Hall, New York.
5. Applied Chemistry for Engineers, R. M. E. Diamant, 3rd Revised Edition, Pitman Publishing.
6. Principles of Physical Chemistry – Puri, Sharma and Pathania, 2017, 4th Edition, Vishal Publishing Co.
7. Physical Chemistry by Peter Atkins, Julio de Paula, 8th Edition, 2006, WH Freeman.
8. Concise Inorganic Chemistry by J.D. Lee, 5th Edition, 2008, Oxford University Press.
9. Electrochemistry and Corrosion Science by N. Perez, 2nd Edition, 2016, Springer.
10. Polymer Science, V.R. Goowriker, N.V Viswanathan and Jayadev Sreedhar, 2nd Edition, 2015, new Age International Publishers.
11. Nanotechnology Fundamentals and Applications, Manasi Karkare, Rajni Bahuguna, 2013, I K international.
12. Nanotechnology Importance And Application, Fulekar, 2010, K International Publishing House.
13. Physics for Engineers by N. K. Verma, 2013, PHI

MTH103C **Mathematics-I** **3-0-0**

Brief Review of Differential Calculus: Limit, continuity and differentiability of functions of several variables, Chain rule, Jacobi theorem. Taylor's theorem of one and two variables, extrema of functions, two or more variables using method of Lagrange's multipliers.

Ordinary Differential Equations: Exact ordinary differential equations and Ordinary differential equations reducible to exact differential equations. Linear differential equations and equations reducible to linear form. Linear Differential equations of second and higher order with constant and variable coefficients. Applications of ordinary differential equations. Series solution of differential equations.

Vector Spaces: Linear dependence of vectors, Basis and Dimensions; Linear Transformations(maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity Theorem, Composition of Linear maps, Matrix associated with a linear map.

Algebraic Equations, Elements of the theory of polynomial equations. Fundamental theorem of Algebra, Relation between the roots and the coefficients of an equation, Solution of cubic & bi-quadratic equations.

Text Books/Reference Books:

1. James Stewart, Calculus, *Early Transcedentals*.
2. Shanti Narayan, Differential calculus, *S. Chand & Sons*.
3. Bali N. P., A text Book on Engineering Mathematics, *Luxmi Publications.*
4. J. W. Brown, R. V. Churchill, Complex variables and Applications, *McGraw Hill Education India.*
5. Raisinghania M. D., Ordinary and Partial Differential equation, *S. Chand & Sons*.
6. Jain R. K., Iyengar S. R. K., Advanced Engineering Mathematics, *Narosa Publications.*
7. Kreyszig I., Advanced Engineering Mathematics, *John Wiley & Sons.*
8. Hoffmann & Kunze, Linear Algebra, *Prentice Hall of India.*
9. Piaggio H. T., Differential equations and its applications, H *Prentice Hall of India.*
10. Sastry, Engineering mathematics Vol I-II, *Prentice Hall of India.*

BIO101C **Environmental Science** **3-0-0**

Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness.

Natural resources: Renewable and non-renewable resources, Natural resources and associated problems,a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non- renewable energy sources, use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem, Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation: Introduction, Definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity, consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster-management: floods, earthquake, cyclone and landslides.

Social Issues and the Environment: From Unsustainable to Sustainable development, urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Case Studies, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

Field work (Field work equal to 5 lecture hours), Visit to a local area to document environmental assets river/forest/grassland/hill/mountain. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc.

Text Books/Reference Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopaedia, Jaico Publ. House, Mumbai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
9. Hawkins R.E., Encyclopaedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
11. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
16. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
17. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
20. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II, Enviro Media (R)
21. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)

MEC101C **Engineering Graphics and Design** **2-0-4**

Introduction: Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance, Drawing instruments, lettering, Conic sections; Cycloid, Epicycloid, Hypocycloid and Involute; Scales.

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

Projections of Solids: Auxiliary Views; Draw simple annotation, dimensioning and scaling. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Sections of Solids: Prism, Cylinder, Pyramid, Cone, Auxiliary Views; Development of surfaces; sectional orthographic views, objects from industry and dwellings.

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

Overview of Computer Graphics: Computer technologies, CAD software, the Menu System, Toolbars, Standard, Object Properties, Draw, Modify and Dimension, Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus, Different commands used in CAD, Isometric Views of lines, Planes, Simple and compound Solids.

Customisation & CAD Drawing: Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints.

Text Books/Reference Books:

1. Gill P. S., Engineering Drawing, *S. K. Kataria and sons.*
2. Bhatt N. D., Engineering Drawing, *Charotar Book Stall.*
3. James D. Bethune, Engineering Graphics with Auto CADD, *Pearson Education.*
4. Narayana, Kannaiya Engineering Drawing, *Scitech Publications, Chennai.*
5. B. C.Rana, M. B. Shah, Engineering Drawing, *Pearson Education.*
6. Shah M. B., Rana B. C., Engineering Drawing and Computer Graphics, *Pearson Education.*
7. Agrawal B., Agrawal C. M., Engineering Graphics, *TMH Publication.*

ENG101C **Communication Skills** **2-0-2**

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

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

Identifying Common Errors in Writing: Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés.

Nature and Style of sensible Writing: Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

Writing Practices: Comprehension, Précis Writing, Essay Writing.

Oral Communication: (This unit involves interactive practice sessions in Language Lab): Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

Text Books/Reference Books:

1. Michael Swan, Practical English Usage, *OUP, 1995*.
2. Wood F. T., Remedial English Grammar, *Macmillan, 2007*.
3. William Zinsser, On Writing Well, *Harper Resource Book, 2001*.
4. Liz Hamp-Lyons and Ben Heasly, Study Writing, *Cambridge University Press, 2006*.
5. Sanjay Kumar and Pushp Lata, Communication Skills, *Oxford University Press, 2011*.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad, *Oxford University Press.*

CIV150C **Engineering Mechanics** **3-0-0**

Force Systems: Basic concepts, equilibrium of rigid bodies, system of forces, coplanar concurrent forces, components in space, resultants, moment of forces and its application, couples and resultant of force system, equilibrium of system of forces, free body diagrams, equations of equilibrium of coplanar systems and spatial systems, static indeterminacy.

Centroid and Centre of Gravity: Centroid of simple figures from first principle, centroid of composite sections, Centre of gravity and its implications;

Area moment of Inertia, Moment of Inertia of plane sections from first principles, theorems of moment of inertia, moment of inertia of standard sections and composite sections, mass moment inertia of Circular plate, Cylinder, Cone, Sphere.

Basic Structural Analysis: Equilibrium of deformable bodies, external and internal forces, stresses and strains in bars, basic introduction to beams, shear force and bending moment in simple beams, basic introduction to torsion, and analysis of trusses using method of joints.

Friction: Types of friction, limiting friction, dry friction, laws of friction, static and dynamic friction; motion of bodies, wedge friction, screw jack, friction clutches and brakes.

Fundamentals of Dynamics: Kinematics and Kinetics of particles in rectilinear and curvilinear motion; Kinematics and Kinetics of Rigid bodies, types of motion, instantaneous centre of rotation in plane motion, D'Alembert's principle and its applications in plane motion and connected bodies, Work Energy principle, Impulse-Momentum principle, Impact.

Text/Reference Books:

1. Irving H. Shames, Engineering Mechanics, *Prentice Hall India, New Delhi.*
2. F. P. Beer, E. R. Johnston, Vector Mechanics for Engineers, Vol I & Vol II, *McGraw Hill Education (India).*
3. R. C. Hibbler, Engineering Mechanics: Principles of Statics and Dynamics, *Pearson Education.*
4. Andy Ruina and Rudra Pratap, Introduction to Statics and Dynamics, *Oxford University Press.*
5. Shanes and Rao, Engineering Mechanics, *Pearson Education.*
6. Hibler and Gupta, Engineering Mechanics (Statics, Dynamics), *Pearson Education.*
7. Bansal R. K., A Text Book of Engineering Mechanics, *Laxmi Publications.*

MTH153C **Mathematics-II** **3-0-0**

Integral Calculus: Definite Integrals and their properties, Differential under the sign of integration. Double and triple integrals, Change of variables, Beta and Gamma functions, Fourier series.

Non-linear differential equation of first order, Simultaneous differential equation, Simultaneous differential equation of the form $dx/P = dy/Q = dz/R$. Partial differential equations of first order, langrage linear equation, Standard form, Charpit`s Method to solve non- linear partial differential equation.

Partial differential equations of second and higher order, Homogeneous Partial Differential equations with constant coefficients, Solutions by the method of separation of variables, heat flow equation, Wave equation.

Matrices: Eigen values and Eigen vectors of a matrix, Cayley-Hamilton Theorem, Symmetric, Skew-symmetric, Hermitian, skew- Hermitian, Orthogonal and unitary matrices and their properties, Diagonalization; Inner product spaces, Gram-Schmidt Orthogonalization.

Complex Variables: Differentiation, Cauchy-Riemann Equations, Analytic functions, Harmonic functions, elementary analytic functions(exponential, logarithmic and trigonometric) and their properties, Taylor's series and Laurent's series.

Text Books/Reference Books:

1. James Stewart, Calculus, *Early Transcedentals*.
2. Kreyszig I., Advanced Engineering Mathematics, *John Wiley & Sons.*
3. Piaggio H. T., Differential equations and its applications, H *Prentice Hall of India.*
4. Raisinghania M. D., Ordinary and Partial Differential equation, *S. Chand & Sons*.
5. Hoffmann & Kunze, Linear Algebra, *Prentice Hall of India.*
6. Shanti Narayan, Integral Calculus by Shanty Narayan, *S. Chand & Sons*.
7. Greenberg, Advanced Engineering Mathematics, *Pearson education.*
8. Sastry, Engineering mathematics Vol I-II, *Prentice Hall of India.*

CSE150C **Programming for Problem Solving** **3-0-0**

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

Branching, Loops, and Arrays: Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops. Arrays, Arrays (1-D, 2-D), Character arrays and Strings.

Algorithms, Order complexity and Functions: Basic Algorithms, Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required), Function, Functions (including using built in libraries), Parameter passing in functions, call by value, Passing
arrays to functions: idea of call by reference.

Recursion: Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort, Structure, Structures, Defining structures and Array of Structures.

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation), File handling.

Text Books/Reference Books:

1. Gottfried, Schaum's Outline of Programming with C, *McGraw Hill Education India.*
2. E. Balaguruswamy, Programming in ANSI C, *McGraw Hill Education India.*
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, *Prentice Hall of India.*

MEC150C **Workshop Practices** **1-0-4**

(i) Lectures and Videos

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods.
2. CNC machining, Additive manufacturing.
3. Fitting operations & power tools.
4. Electrical & Electronics.
5. Carpentry.
6. Plastic moulding, glass cutting.
7. Metal casting.
8. Welding (arc welding & gas welding), brazing.

(ii) Workshop Practice

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop (Arc welding, gas welding)
6. Casting
7. Smithy Shop

Text Books/Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

ELE50C **Basic Electrical Engineering** **3-0-0**

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits, resonance in series and parallel RLC circuits. Three phase balanced circuits, voltage and current relations in star and delta connections.

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

Electrical Machines: Generation of rotating magnetic fields. Construction and working of a three-phase induction Motor. Significance of torque -slip characteristic. Starting of induction motor. Construction, working, torque-speed characteristic of separately excited dc motor. Construction and working of synchronous generators.

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries.

Text Books/Reference Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", *Tata McGraw Hill, 2010*.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", *McGraw Hill, 2009*.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", *Oxford University Press, 2011*.
4. E. Hughes, "Electrical and Electronics Technology", *Pearson, 2010*.
5. V. D. Toro, "Electrical Engineering Fundamentals", *Prentice Hall India, 1989*.
6. Charles K. Alexender, Mathew N. O. Sadiku,"*Fundamentals of Electric circuits"*
7. Jack E. Kemmerly William H. Hayt ,"Engineering Circuit Analysis*" McGraw Hill, 2012*

CSE151C **Programming Lab** **0-0-2**

List of Experiments

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

PHY150C **Physics Lab** **0-0-2**

List of Experiments

1. To determine the value of e/m of an Electron by Thompson Method
2. To determine the value of Acceleration due to gravity(g) by using Bar Pendulum
3. To determine the value of Acceleration due to gravity(g) by using Kater's Reversible Pendulum
4. To determine the Young's Modulus of rigidity of rectangular Steel Bar by Bending of Beam Method.
5. To determine the Wavelength of Sodium Light by Newton's Rings.
6. To determine the Wavelength of Laser Source by Fresnel Biprism
7. To determine the frequency of AC by Melde's Method
8. To determine The Resolving Power of Telescope.
9. To study the moment of Inertia of a Fly Wheel
10. To determine the refractive index of Crown Glass Prism.
11. To determine the wavelength of Sodium Light by Plane diffraction Grating.
12. To study the characteristics of Zener Diode.
13. To determine the Wavelength of Prominent lines of Mercury Light by Plane Diffraction Grating.
14. To study the characteristics of PN Junction Diode (Forward Bias)
15. To verify Biot-Savart's Law by showing that magnetic field produced is directly proportional to the current passed in a coil.
16. To study the characteristics of G.M. Tube.
17. To determine Planck's constant by LED Method.
18. To verify Stefan's Law by Electrical method.
19. Determination of Modulus of rigidity by Maxwell's Needle
20. Determination of velocity of Sound by Standing Wave Method.
21. To study the Hall Effect:
    (i) Determination of Hall Voltage and RH.
    (ii) Determination of mobility of charge carriers and carrier concentration

CHM150C **Chemistry Lab** **0-0-2**

List of Experiments

1. Basic Introduction on Solution Preparation, Concentration terms, Handling of Glass ware, Chemicals, Instruments: Precautions.
2. Determination of strength of NaOH solution by standardization of sodium hydroxide using Oxalic acid
3. To determine the acid value of a given mineral oil or vegetable oil.
4. To determine the moisture content of a given sample of coal.
5. To determine the Degree of dissociation of a weak acid by Conductometry.
6. Determination of the strength and pK_a value of the weak acid by titration with an alkali.
7. To determine the Aniline point of the given sample of a Lubricating oil.
8. Synthesis of the phenol formaldehyde resin.
9. To determine the temporary and permanent hardness of a sample of water by complexometric titration.
10. To determine the Alkalinity of the given sample of water.
11. Determination of the ion exchange capacity of cation exchange resin.

Demonstration Experiments

1. Determination of pH of different concentration of acid and bases by pH meter.
2. Spectrophotometer (concentration determination, wavelength maximum)

Text Books/Reference Books:

1. Laboratory Manual On Engineering Chemistry by S. K. Bhasin, S. Rani, 2009, D R Publications.
2. Advanced Practical Physical Chemistry by J. B. Yadav.

Semester-III **SecondYear**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-311T	Structural Analysis I	3	1	0	60	4
2.	CIV-312T	Surveying Measurements & Adjustments	2	1	0	45	3
3.	CIV-313T	Fluid Mechanics I	2	1	0	45	3
4.	CIV-314T	Building Materials & Construction	2	1	0	45	3
5.	MTH-312T	Probability & Statistics	2	0	0	30	2
6.	CIV-315P	SOM Lab	0	0	2	15	1
7.	CIV-316P	Surveying Measurements & Adjustments Lab	0	0	2	15	1
8.	CIV-317P	Fluid Mechanics Lab I	0	0	2	15	1
9.	YYY-yyyT	Open Elective	*	*	*	30	2
10.	XXX-xxxTP	Generic Elective (SOT)	*	*	*	30	2
Total Credits							22

CIV-311T-Structral Analysis: I

L-T- P

3- 1-0 **Credits: 4**

UNIT I: BASIC CONCEPTS OF STRUCTURAL ANLYSIS

Structure, structural engineering, structural form, simplification for the purpose of analysis; Types of loads (point, uniformly distributed and varying), Types of supports (hinged, roller, fixed). Specification of a force, free body diagrams, Equations of equilibrium, Condition equation; Compatibility; Boundary Conditions; Principle of Superposition; Stiffness and Flexibility.Bending moment and Shear force in determinate beams (Simply supported beams, cantilever, and overhanging beams).

UNIT II: BENDING AND SHEAR STRESS IN BEAMS

Theory of simple bending, Flexural formula; Bending Stress and Shear Stress Diagram for Homogeneous Beam sections of various shapes; Composite sections; Applications to simpler problems.

UNIT III: SLOPES AND DEFLECTIONS

Slope and Deflection of determinate beams by Double Integration Method; Moment Area Method; Conjugate Beam Method

UNIT IV: COMPOUND STRESSES

Normal and tangential stresses, Principal stresses and strains, Principal planes, Mohr's circle of stress, Evaluation by analytical and graphical method.

UNIT V: ANALYSIS OF COLUMNS AND ARCHES

Types of columns - Short and long columns, Stresses in columns; Buckling phenomenon; Euler's and Rankine's theory of Crippling loads; Stresses in eccentrically loaded columns.

Analysis of 3- Hinged Arches, Temperature effect.

BOOKS RECOMMENDED:

1. Introduction to Structural Engineering John M.Biggs
2. Determinate Structures: R.L.Jindal
3. Theory of Structures: Ramamurtham
4. Analysis of Structures: Thandavamoorthy
5. Strength of Materials: Singer and Pytel
6. Mechanics of materials: R C Hibbeler

CIV-312T-Surveying Measurement and Adjustment

L-T-P
2-1- 0 **Credits:3**

UNIT I: FUNDAMENTALS AND CHAIN SURVEYING

Definition- Classifications - Basic principles-Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles – Errors in linear measurement and their corrections - Obstacles - Traversing – Plotting – applications- enlarging the reducing the figures – Areas enclosed by straight line irregular figures- digital planimeter.

UNIT II: PRISMATIC COMPASS AND PLANE TABLE SURVEYING

Compass – Basic principles - Types - Bearing - Systems and conversions- Sources of errors - Local attraction - Magnetic declination-Dip-Traversing - Plotting - Adjustment of closing error – applications - Plane table and its accessories - Merits and demerits - Radiation - Intersection - Resection – Traversing-sources of errors – applications.Temporary adjustments of a prismatic compass.

UNIT III: LEVELLING

Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments – Methods of levelling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Curvature and refraction - Reciprocal levelling – Sources of Errors in levelling- Precise levelling - Types of instruments - Adjustments - Field procedure

UNIT IV: LEVELLING APPLICATIONS

Longitudinal and Cross-section-Plotting - Contouring - Methods - Characteristics and uses of contours – Plotting – Methods of interpolating contours – Computations of cross sectional areas and volumes - Earthwork calculations - Capacity of reservoirs - Mass haul diagrams.

UNIT V: THEODOLITE SURVEYING

Theodolite - Types - Description - Horizontal and vertical angles - Temporary and permanent adjustments – Heights and distances– Tangential and Stadia Tacheometry –Subtense method - Stadia constants - Anallactic lens

BOOKS RECOMMENDED:

1.Surveying volume I by Dr.K.R.Arora
2.SurveyingVol.II by Dr. K. R. Arora
3.SurveyingVol.II by S.K Duggal, Tata McGraw Hill, N.Delhi. 4.Basak “Surveying and levelling”
5.Surveying Volume I by Duggal S.K.
6.Surveying and leveling by P.B. Shahni

CIV-313T-Fluid Mechanics-I

L-T-P

2-1-0 **Credit: 3**

UNIT I: INTRODUCTION:

Physical properties of Fluids: mass density, viscosity, compressibility, vapour pressure, surface tension, capillarity, etc. Ideal Fluids and Real Fluids; Newtonian and non-Newtonian fluids.

UNIT II: FLUID STATICS

Pressure Intensity, Pascal's law; Pressure density-height relationships; manometers; pressure on plane and curved surfaces; centre of pressure; Buoyancy; stability of immersed and floating bodies, Metacentric height and its determination.

UNIT III: KINEMATICS OF FLUID FLOW:

Steady and unsteady; Uniform and non-uniform; laminar and turbulent flows; one, two and three dimensional flows; Streamlines, streak lines and path lines; Eulerian and Lagrangian approaches; continuity equation; rotation, circulation and vorticity; Elementary explanation of stream function and velocity potential; Graphical method of drawing flow nets.

UNIT IV: DYNAMICS OF FLUID FLOW:

Euler's equation of motion along a streamline and its integration to yield Bernoulli's equation; flow measurement; flow through orifice-meter; Venturimeter; orifices, mouth-pieces, Pitot and Prandtl tubes, sluice gates under free and submerged conditions, various types of notches and weirs under free and submerged conditions, aeration of Nappe; momentum equation and its application to stationary and moving vanes.

UNIT V: DIMENSIONAL ANALYSIS AND HYDRAULIC SIMILITUDE:

Dimensional analysis, Buckingham's theorem; Important Dimensionless numbers and their significance, geometric, kinematic and dynamic similarity; Model Analysis.

Boundary Layer Analysis-Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, Application of momentum equation, turbulent boundary layer, Laminar sub-layer, smooth and rough boundaries, local and average friction coefficients, separation.

BOOKS RECOMMENDED:

1. Bansal, R.K. "Fluid Mechanics and Hydraulic machines"
2. Kumar, D.S. "Engg. Fluid Mechanics"
3. Engg; Fluid Mechanics by R.J.Garde

CIV-314T-Building Materials & Construction Techniques

L-T- P

2-1-0 **Credit: 3**

UNIT I:

Bricks and Timber: Bricks, classification, characteristics of good bricks, testing of bricks as per BIS, defects of bricks. Terms used and types of brick bonds. Timber, seasoning of timber, defects in timber, decay and preservation, testing of timber.

UNIT II:

Cement and Lime: OPC and its composition, types of cement Lime, Classification of lime, slaking and hydration, hardening, testing of lime.

UNIT III:

Floors and Roofs: types of floors and their suitability, flooring material and their construction details, Roofs and roof coverings, classification of roofs with special reference to pitched roofs, roof covering materials.

UNIT IV:

Foundations, their types and suitability, walls, different types of walls including cavity walls, doors, windows, lintels, types of doors and windows, brief introduction to ramps, lifts and escalators.

UNIT V:

Wall finishes, plastering, pointing and painting. Special treatments, fire resistance, damp proofing, thermal insulation, acoustical construction of buildings.

BOOKS RECOMMENDED:

1. Building materials by Parbin Singh.
2. Building materials and construction by Gurcharan Singh.
3. Building materials and construction by Ragawala.
4. Building construction by Sushil Kumar.

MTH-312T- Probability &Statistics

L-T- P
2-0-0 **Credits: 2**

UNIT-I:
Statistics: Measures of central tendency and Measures of variations (Dispersions), Moments, Measures of Skewness and Kurtosis, problems.

UNIT-II:
Probability: Random experiment, sample space, events, classical, statistical and axiomatic definitions of probability. Statement and proof of addition theorem on probability, Conditional probability and multiplication theorem of probability, problems.

UNIT-III:
Bayes theorem on conditional probability. Random variables, Derivation of formulae for mean, variance and moments of random variables for discrete and continuous cases. Bivariate random variable, Joint distribution function, Marginal function, Expected value of a random variable, Laws of expectation, Problems.

UNIT-IV:
Standard Distributions: Binomial, Poisson and Normal Distributions, Beta and Gamma Distribution, t Distribution, F-Distribution, Chi-square Distribution and their applications.

UNIT-V:
Method of Least Squares & Correlation: Methods of least squares, fitting of straight line and parabola of degree 'p'. Regression and Correlation. Multiple and Partial Correlation. Problems

BOOKS RECOMMENDED:
1. Fundamentals of Mathematical Statistic by S.C.Gupta and V.K. Kapoor, Sulltan Chand & Sons New Delhi, Latest edition.
2. Statistical Theory and Methodology in Science & Engineering by Brownlee, John Wiley &Sons.
3. Introduction to Mathematical Statistics by R.E.Walpole 3rd edition New York Macmillan publication.
4. Data Analysis for Scientists & Engineers by Meyer, John Wiley & Sons.

CIV-315P-SOM Lab

L- T-P
0 -0-2 **Credit: 1**

LIST OF EXPERIMENTS:

1. **Tensile Test of Steel**- To determine yield strength, ultimate tensile strength, percentage elongation and modulus of elasticity of structural steel (Plot, stress strain curve)

2. **Tensile Test of Steel**- To determine yield strength, ultimate tensile strength, percentage elongation and modulus of elasticity of round steel bars (Plot, stress strain curve

3. **Tensile & Compressive strength of Timber-** a) Parallel to grains, b) Perpendicular to grains**.**

4. **Bending test of Steel/Timber-** To measure deflection and determine stiffness factor (Plot load-deflection curve)

5. **Shear test of steel/Timber-** To measure ultimate shear strength, shear modulus and Plot shear stress-strain curve.

6. **Impact test of Steel-** To determine the impact strength of notched mild steel test piece using Charpy Test and Izode Test

7. **Buckling load of columns with various end conditions-** To determine crippling load of columns with different end conditions and compare theoretical values.

8. Testing of Bricks and Stones as per IS specifications.

9. Specifications and Common tests as per ISS for Roofing Tiles

10. Specifications and Common tests as per ISS for Flooring Tiles Mosaic, Marble and Ceramic tiles

CIV-316P-Surveying Measurements and Adjustments Lab

L- T-P
0 -0-2 **Credit:1**

LIST OF EXPERIMENTS:

1. Study of chains and its accessories.
2. Aligning, Ranging and Chaining.
3. Chain Traversing.
4. Compass Traversing.
5. Plane table surveying: Radiation.
6. Plane table surveying: Intersection.
7. Plane table surveying: Traversing.
8. Plane table surveying: Resection – Three point problem.
9. Plane table surveying: Resection – Two point problem.
10. Study of levels and leveling staff.
11. Fly leveling using Dumpy level.
12. Fly leveling using tilting level.
13. Check leveling.
14. LS and CS.
15. Contouring.

CIV -317P-Fluid Mechanics Lab-I

L-T-P
0-0-2 **Credit:1**

LIST OF EXPERIMENTS:

1. To determine experimentally the meta-centric height of a ship model
2. To verify the Bernoulli's equation experimentally
3. To determine the coefficient of discharge, coefficient of velocity and coefficient of contraction of an orifice or a mouth-piece of a given shape.
4. To calibrate an orifice meter and to find its coefficient of discharge Cd.
5. To calibrate a venturimeter and to find its coefficient of discharge Cd.
6. To calibrate a sharp crested triangular weir.

Semester –IV

Semester-IV **Second Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-411T	Structural Analysis II	3	1	0	60	4
2.	CIV-412T	Advanced Surveying Measurements	2	1	0	45	3
3.	CIV-413T	Fluid Mechanics II	2	1	0	45	3
4.	CIV-414T	Concrete Technology	2	1	0	45	3
5.	CIV-415T	Building Drawing & AUTOCAD	0	1	4	45	3
6.	MTH-412T	Numerical Methods	2	0	0	30	2
7.	CIV-416P	Concrete Technology Lab	0	0	2	15	1
8.	CIV-417P	Fluid Mechanics Lab II	0	0	2	15	1
9.	CIV-418P	Advanced Surveying Measurements Lab	0	0	2	15	1
10.	CIV-419P	Structure Lab	0	0	2	15	1
11.	CIV-410P	Survey Camp	0	0	2	15	1
Total Credits							23

CIV- 411T- STRUCTRAL ANALYSIS: II

L-T-P

3-1-0 **Credits: 4**

UNIT I: INTRODUCTION TO INDETERMINATE STRUCTURES

Introduction to Indeterminate structure, Degree of Freedom, Kinematic and Static indeterminacy of structures (Statically indeterminate structures, Redundant Frames, degree of indeterminacy), Equilibrium and stability conditions.

UNIT II: FORCE METHODS OF ANALYSIS OF STRUCTURES

Method of consistent deformation for analysis of indeterminate beams; Continuous beams; Analysis of fixed beams by integration and moment area method, 3 Moment equation.

UNIT III: SLOPE DEFLECTION METHOD

Analysis of indeterminate Beams and Frames (with and without Sway) by slope deflection method, yielding of supports.

UNIT IV: MOMENT DISTRIBUTION METHOD

Distribution factors, Analysis of indeterminate Beams and Frames (with and without Sway) by moment distribution method, yielding of supports.

UNIT V: INFLUENCE LINE DIAGRAMS FOR DETERMINATE AND INDETERMINATE STRUCTURES:

Principles of influence lines and application to determinate structures (Beams, Trusses, Arches).Criteria for absolute maximum moment and shear under series of moving loads.

Qualitative analysis for indeterminate structures, Muller Breslau's Principle.

BOOKS RECOMMENDED:

1. Indeterminate Structural Analysis by C.K.Wang
2. Indeterminate Structural Analysis by R.L.Jindal.
3. Structural mechanics by Norris and Wilbur.
4. Theory of Structures by S.Ramamrutham R.Narayan
5. Analysis of Structures: Thandavamoorthy
6. RC Hibbler- Analysis of Structures

CIV-412T-ADVANCED SURVEYING MEASUREMENTS

L-T-P

2-1-0 **Credit: 3**

UNIT I: CONTROL SURVEYING

Horizontal and vertical control, Methods, specifications, triangulation, baseline , instruments and accessories – corrections – satellite stations – reduction to centre- trigonometrical levelling – single and reciprocal observations – traversing – Gale's table.

UNIT II: SURVEY ADJUSTMENT

Errors Sources- precautions and corrections – classification of errors – true and most probable values- weighed observations – method of equal shifts –principle of least squares -0 normal equation – correlates- level nets- adjustment of simple triangulation networks.

UNIT III: TOTAL STATION SURVEYING

Basic Principle – Classifications -Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave System. Care and maintenance of Total Station instruments. Modern positioning systems – Traversing and Trilateration.

UNIT IV: GPS SURVEYING

Basic Concepts - Different segments - space, control and user segments - satellite configuration - signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment – Hand Held and Geodetic receivers –data processing - Traversing and triangulation.

UNIT V: ADVANCED TOPICS IN SURVEYING

Route Surveying - Reconnaissance - Route surveys for highways, railways and waterways - Simple curves – Compound and reverse curves - Setting out Methods – Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves - Sight distances- hydrographic surveying – Tides - M

BOOKS RECOMMENDED:

1) Surveying Vol. II by Dr. K. R. Arora
2) Surveying Vol. II by S.K Duggal, Tata McGraw Hill, N. Delhi.
3) Surveying and Leveling by Basak, Tata Mcg raw Hill, N. Delhi
4) Surveying Vol. II by B.C Punima, Vol 2, Laxmi Publications Pvt. Ltd. N. Delhi
5) Surveying & Levelling by P.B. Shahni

CIV-413T-Fluid Mechanics – II

L-T-P

2-1-0 **Credit: 3**

UNIT I: FLOW IN OPEN CHANNELS

Uniform flow, critical depth, Normal depth, Specific energy, Resistance formulae, gradually varied flow equations, Classification of water surface profiles, Computation of water surface profiles, step by step method and graphical integration method. Hydraulic jump, Momentum Principle for open channels, Evaluation of the jump elements. Venturi-flumes. Hydraulically efficient channel sections.

UNIT I: FLOW THROUGH PIPES

Nature of turbulent flow in pipes, Hydraulic and energy grade lines. Equation for velocity distribution over smooth and rough pipes, Resistance coefficient and its variation, Nikuradse experiments, Moody diagram, Flow in sudden expansion, Contraction, diffusers, Bends, Valves and Siphons; Concept of equivalent length, branched pipes in series and parallels, Simple networks, Transmission of power.

UNIT II: FLUID FLOW PAST SUBMERGED BODIES

Drag and lift, Drag on a sphere, cylinder and disc: Lift, Magnus effect and Circulation.

UNIT IV: WATER HAMMER AND SURGE TANKS

Sequence of events after sudden valve closure, pressure diagrams, Gradual closure or opening of the valve, Instantaneous closure of valve in a rigid pipe, Instantaneous closure of valve in an Elastic pipe and compressible fluid, Methods of Analysis; Surge tanks, Location of surge tanks, types, Design of surge tanks.

UNIT V: HYDRAULIC MACHINES

Types of Turbines, Description and principles of impulse and reaction Turbines, Unit quantities and specific speed, Runaway speed, Turbine characteristics, Selection of Turbines, Cavitation; Draft tube, Draft tube dimensions, Types of Draft tubes; Centrifugal pumps, specific speed power requirements, Reciprocating pumps.

BOOKS RECOMMENDED:

1) Engineering Fluid Mechanics by R.J.Garde.
2) Open Channel Flow by Subramanaya.
3) Fluid Mechanics and Hydropower Engg. By Dr D.S Kumar
4) Handbook of Hydroelectric Engg. by Nigam
5) Flow through Open Channels by Ranga Raju, Tata McGraw Hill Publishing Company Ltd. N.Delhi.
6) Asawa, GL "Fluid Flow in Pipes and Channels" CBS Publishing

CIV-414T- Concrete Technology

L-P-T

2-1-0 **Credits: 3**

UNIT I: Ingredients of Concrete

Review of Cements, Chemical Composition, Aggregates: Review of Types; Elementary Mineralogy and Petrology; Sampling and Testing; E□ects on Properties of Concretes, Chemical and Physical Processes of Hydration. Chemical and Physical Processes of Hydration and Interaction, E□ects on Properties of Concretes. Admixtures: accelerators, retarders, superplasticizers, water reducing, air-entraining.

UNIT II: Properties of concrete: Fresh and Hardened Concrete

Workability, Segregation and Bleeding, Theory and Principles governing the correct transportation, Placing, Compaction and Curing of Concrete. Plastic Settlement and Plastic Shrinkage, Exothermic Characteristics: Early Age Thermal Movements, Strength Development, Maturity.
Strength, Deformation under Load, Elasticity, Creep, Drying Shrinkage and other volume Changes. Thermal Properties

UNIT III: Durability of Concrete and Concrete Construction

Durability Concept, Pore Structure and Transport Processes, Reinforcement Corrosion, Fire Resistance, Frost Damage, Sulfate Attack, Alkali Silica Reaction, Methods of Providing Durable Concrete.

UNIT IV: Concrete Mix Design

The process of Mix Selection, Factors governing the selection of Mix Proportions, Combining Aggregates to obtain Specified Grading, Di□erent Methods of Mix Design (based on IS and ACI codes), Concepts of Statistical Quality Control of Concrete Construction.

UNIT V: Special Concrete

Properties and applications of: High strength-High performance concrete, reactive powder concrete. Light weight, heavyweight, and mass concrete; fiber reinforced concrete; self-compacting concrete; shotcrete; Accelerated curing, hot and Cold Weather Concrete

BOOKS RECOMMENDED:

1. T E French, C J Vierck and R J Foster, Graphic Science and Design, 4th edition, McGrawHill, 1984.
2. W J Luzadder and J M Du□, Fundamentals of EngineeringDrawing, 11th edition, Prentice-Hall Of India, 1995.
3. K Venugpoal, Engineering Drawing and Graphics, 3nd edition, New Age International, 1998
4. Dhananjay A Jolhe, Engineering drawing, TMH, 2008

CIV-415TP- Building Drawing and AutoCAD

L-T-P

0-1-4 **Credit: 3**

UNIT 1:

Foundations: Principles of foundations, types and suitability of foundations including strip, pad, raft, pile and pier foundation, details of spread footing foundation with the help of given data or rule of thumb, showing offsets, positions of DPC.

UNIT II:

Drawing of Columns, Stair and Staircase, Various types and materials, drawing of various components of a Dog-legged stair case (section and Plan). Roofs & Roof Coverings: Classification of roofs with special reference to pitched roofs; Drawing of various timber trusses.

UNIT III:

Elevation, sectional plan and sectional side elevation of Doors, windows and ventilators. Location, size and different types. Drawing of RCC slabs (One and two way); beams (including cantilever);

UNIT IV:

Drawing of Building Plan, Sectional and foundation of a small building by measurement and foundation detail. Drawing of detailed plan, elevation and section of a two room residential building from a given line plan, showing details of foundation, roof and parapet.

UNIT V: Introduction

Introduction of CADD (Computer Aided Drafting & Designing) Practice on Drawing Basics Drawing Elementary CADD commands.

Function keys, Shortcut keys, Paper size. Making Title Block, writing it & inserting it in any drawing file with scale, angle & explode options. Drafting of building plan, Elevation, Section Views giving construction details of important building components including foundation, plinth. DPC, lintels, slabs and roofs; full specifications for each component.

Introduction to AutoCAD 3D.

BOOKS AND SOFTWARES RECOMMENDED:

1. AutoCADD software
2. Building Drawing by M.G.Shah
3. Civil Engineering Drawing by Chakorbarty
4. Civil Engineering Drawing by J.B.Mckay
5. Building Drawing by V.B.Sikka

MTH-412T – Numerical Methods

L-T-P

2-0-0 **Credits: 2**

UNIT I

Finite Difference: Difference Table and its usage. The difference operators and the operator 'E', Interpolation: Interpolation with equal intervals, Newton's advancing difference formula Newton's backward difference formula Interpolation with unequal intervals Newton's divided difference formula Lagrange's interpolation formula.

UNIT II

Inverse interpolation: Inverse interpolation by (i) Lagrange's Method (ii) Methods of successive 'E' approximation (iii) Methods of elimination of third differences Numerical solution of algebraic and Transcendental Equations:

UNIT III

Numerical Integration: Numerical Integration, General Quadrature Formula, Simpson's One-third and Three-Eighth rules, Weddles' rule, Hardy's rule, Trapezoidal rule. Numerical Differentiation.

UNIT IV

Difference Equations: Linear-homogeneous and Non-homogenoeus difference equations of order 'n' with constant co-efficient, and their solution, Method of undetermined coefficients.

UNIT V

Numerical Solution of ordinary differential equations: Numerical solution of ordinary differential equations, Picard's method. Taylor's series method, Euler's method, Runge-Kutta Method.

BOOKS RECOMMENDED:

1. Numerical Methods for Scientists and Engineering, M.K. Jain, S.R. Iyengar & R.K. Jain, Wiley Eastern Ltd.
2. Mathematical Numerical Analysis by S.C. Scarborough, Oxford and IBH Publishing Company.
3. Introductory methods in Numerical Analysis by S.S. Sastry, Prentice Hall of India.
4. Numerical Solution of Differential equations, M.K. Jain.

CIV-416P-Concrete Technology Laboratory

L-T-P

0-0-2 **Credits: 1**

LIST OF EXPERIMENTS:

A) FINE AGGREGATES:-

1. Grading & Zoning of Fine aggregates.
2. Specific gravity of fine aggregates.

B) COARSE AGGREGATES:-

1. Grading & Zoning of Coarse aggregates.
2. Determination of Water absorption of coarse aggregates.

C) CEMENT:-

1. Determination of standard consistency of cement.
2. Determination of initial setting time and final setting time of cement.
3. Determination of fineness of cement.
4. Soundness test of Concrete.

D) CONCRETE:-

1. Determination of consistency of fresh concrete by Slump test
2. Determination of workability of freshly mixed concrete by Compaction factor Test.
3. Determination of cube strength of concrete for different mixes and different W/C ratios.
4. Determination of tensile strength of concrete by cylinder splitting test.
5. Determination of flexural strength of concrete beam.

CIV -417P-Fluid Mechanics Laboratory-II

L-T-P

0-0-2 **Credits: 1**

LIST OF EXPERIMENTS:

1. To determine the loss coefficient for various pipe fittings.
2. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
3. To determine Manning's coefficient of roughness 'n' for the bed of a given flume.
4. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
5. To calibrate a broad crested weir
6. To study the formation of hydraulic jump.

CIV-418P-Advanced Surveying Measurements Lab

L-T-P

0-0-2 **Credit: 1**

LIST OF EXPERIMENTS:

1. Study of Theodolite
2. Measurement of horizontal angles by reiteration and repetition and vertical angles.
3. Theodolite survey traverse.
4. Heights and distances - Triangulation - Single plane method.
5. Tacheometry - Tangential system - Stadia system - Subtense system.
6. Setting out works - Foundation marking - Simple curve (right/left-handed) - Transition Curve.
7. Measurement of Horizontal and Vertical distance using Total Station.
8. Traversing and Area Calculation using Total Station.

CIV- 419P- Structural Laboratory

L-T-P
0-0-2

Credits: 1

LIST OF EXPERIMENTS:

1. Deflection of curved beams.
2. Behavior of Portal Frame under different load combinations.
3. Deflection of Truss.
4. Behavior of a cantilever beam under symmetrical and un-symmetrical loading.
5. Analysis of an elastically coupled beam.
6. Analysis of a redundant joint.
7. Analysis of two hinged arch.
8. Study of Loading frame and Degrees of loading.
9. Verification of Maxwell's Theorem- To verify the Principle of Maxwell's Theorem.
10. Verification of Horizontal Thrust in a 3-Hinged Arch- To evaluate experimentally horizontal thrust in a 3-Hinged arch and draw influence line diagram for the horizontal thrust.

CIV-410P- Survey Camp

L-T-P

0-0-2 **Credits: 1**

1. Triangulation:
   (i) Ordinary Methods (ii) On the basis of Global Positioning System (GPS).

2. Shifting of Horizontal and Vertical Controls.

3. Setting out of works.

4. Setting out of Curves.

5. Contouring :(i) Contouring of a Dam Reservoir/Railway line
   (ii) Preparing a contour plan by various methods.
   (iii) Setting out of Contour lines of an appropriate sit

Semester –V

Semester-V **Third Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-511T	Design Of Concrete Structures-I	2	1	0	45	3
2.	CIV-512T	Geotechnical Engineering-I	2	1	0	45	3
3.	CIV-513T	Water Supply Engineering	2	1	0	45	3
4.	CIV-514T	Quantity Survey & Cost Estimation	2	1	0	45	3
5.	CIV-515T	Structural Analysis III	2	1	0	45	3
6.	CIV-516T	Construction Technology and Management	2	0	0	45	2
7.	CIV-517P	Geotechnical Lab I	0	0	2	15	1
8.	CIV-518P	Water Quality Lab	0	0	2	15	1
9.	YYY-yyyT	Open Elective	*	*	*	30	2
Total Credits							21

CIV-511T-Design of Concrete Structures-I

L-T-P

2–1-0 **Credits: 3**

UNIT I: PROPERTIES OF CONCRETE AND REINFORCING STEEL AND GENERAL DESIGN PHILOSOPHIES

Characteristic strength, stress-strain curves for Concrete and steel, IS specifications. Design Philosophies-Working stress method, Ultimate load method & limit state method of design. Analysis & design of structures in flexure/torsion by limit state method.

UNIT II: ANALYSIS & DESIGN OF BEAMS

Flexural behavior of reinforced concrete beams, Analysis &design of Rectangular, T & L Sections, Codal Provisions. Behavior of RCC Beams in shear, Design for shear, Anchorage & slipping of Reinforcement. Torsion of Beams and design; Detailing of reinforcement as per Codal provisions with reference to IS:456. Serviceability limit state of deflection & cracking. Calculation of deflection, Codal requirements.

UNIT III: DESIGN OF COLUMNS

Types RCC Columns- Short & long Columns, Analysis and design of Axially loaded RCC Columns, Design of RCC columns for uni-axial and bi-axial moments, Helical Reinforcement and Transverse Reinforcement.

UNIT IV: DESIGN OF SLABS

Design of one-way and two-way RCC slabs with and without corners held down. Introduction to design of slabs by Moment Coefficient Method. Introduction to Flat Slabs.

UNIT V: DESIGN OF FOOTINGS

Types of footings, Design of isolated RCC footings and wall footings, Effect of varying water table conditions on design of footings**.**

BOOKS RECOMMENDED:

1. Design of Reinforced Concrete & Pre-Stressed Concrete Structures by Kong & Evans.
2. Design of Reinforced Concrete: Limit State Design by A.K.Jain.
3. Design of RCC Structures by Sinha.
4. Design of RCC Structures by Karve & Shah.
5. Reinforced Concrete Design by Pillia Menon.
6. Treasure of RCC Design by Sushil Kumar.
7. IS Code 456-2000

CIV-512T Geotechnical Engineering

L-T-P

2-1-0 **Credits: 3**

UNIT I: INTRODUCTION

Soil and its formation, various agencies for formation; Types of Soils. Three phase soil Model, Index properties and classification of soils. Soil structure.

UNIT II: SOIL HYDRAULICS

Flow through soils, Darcy's Law. Permeability Factors and determination in the lab/Field. Steady state Flow, seepage force, Laplace equation for steady state flow, flow nets, for homogenous embankments with & without toe filters.

UNIT III: SOIL CONSOLIDATION & COMPACTION

One Dimensional Consolidation, Terzaghi's equation, Assumptions of Terzaghis equation. Consolidation test, e log p curves. Consolidation settlement, time required for settlement, Settlement during construction. Compaction, laboratory compaction tests, proctor compaction, compaction curve and control on field compaction.

UNIT IV: EFFECTIVE STRESS & STRESS DISTRIBUTION

Total & effective stresses, Pore Water pressure, Stress distribution under concentrated load. Westergard's and Boussineq's method

UNIT V: SOIL INVESTIGATION & CLAY MINERALOGY

Laboratory & Field Investigation. Sub-soil exploration, Penetration methods, Geo-Physical methods, electromagnetic method, electric resistivity method and Seismic method. Minerals Present in clay, dependence of behavior of clay on type of mineral.

BOOKS RECOMMMENDED:

1. Soil Mechanics by Alam Singh
2. Theoretical Mechanics by Terzaghi& Peck
3. Soil Mechanics by S.B. Saighal
4. Geotechnical Engineering by Purushotama Raj
5. Geotechnical Engineering by C.Venkataramiah
6. Geotechnical Engineering by K.R.Arora.
7. Geotechnical Engineering by S.K.Garg

CIV -513T-Water Supply Engineering

L -T- P

2 –1-0 **Credits : 3**

UNIT I: WATER QUALITY

Introduction and scope, Various sources of water, Water Quality Parameters, significance and codal recommendations of limits for various uses

UNIT II: WATER CONSUMPTION & WATER DISTRIBUTION

Water Consumption for various uses, variation in Demand & Supply. Population forecasting methods, storage capacities of reservoirs, Systems of distribution, distribution networks

UNIT III: WATER TRANSPORTATION

Pipe designs, network analysis by various methods, pipe materials and joints, leakage prevention.

UNIT IV: TREATMENT PROCESS

Water treatment: Conventional treatments like screening, sedimentation, Coagulation, Filteration, Disinfection. Advanced treatments like Ozonation and Activated carbon adsorption, etc**.**

UNIT V: SANITATION

Water supply in buildings, Plumbing and fixtures, Sanitation of buildings.

BOOKS RECOMMENDED:

1. Water supply Engineering by P.N.Modi
2. Water supply & sewerage by E Steel
3. Water supply Engg. By Punmia
4. Water supply & Sanitary Engg by S K Hussain

CIV-514T-Quantity Survey & Cost Estimation

L-T-P

2-1-0 **Credits :3**

UNIT I: ESTIMATE

Importance, items of a work and their units. Types of Estimate, viz; preliminary; approximate; Abstract estimate; plinth area estimate; detailed estimate; revised estimate; supplementary estimate, bill of quantities and abstract of cost.

UNIT II: ANALYSIS OF RATES

Preparing of rates, Labour schedule, material schedule and rate schedule. Analysis of rates-of lime concrete in Foundation; Brickwork in foundation in superstructure; stone masonry; RCC masonry; RCC work; RB work; Plastering; Pointing; white washing; colour; washing; painting; woodwork; earthwork in foundation; earthwork in road; DPC; steel work for reinforcement; steel work in trusses; woodwork in frames, shutters, etc.

UNIT III: WORKS ESTIMATE

Estimates of building; Estimates of walls; methods of building estimate; Longwall, shortwall& centerline methods; Estimate of masonry platform; estimate of a masonry tank, estimate of roof trusses; Estimate of a single roomed building; estimate of a 2 roomed building with CGI roof over wooden trusses and over steel truss; estimate of a shop; estimate of a RCC Beam; RCC slab.

UNIT IV: ESTIMATE OF ROAD

Methods of estimate; materials for different items of works and labour; methods of estimating earthwork; estimate of a metalled road.

UNIT V: VALUATION, RENT FIXATION & SPECIFICATIONS

Valuation of building various methods; rent fixation, plinth area requirements.

General specifications & detailed specifications, Book of specifications, specifications, specifications for earthwork in foundation; LC in foundation; RCC work; Brick work; RB work; woodwork in doors, windows, etc. DPC centering & shuttering; earthwork in canal & road.

BOOKS RECOMMENDED:

1.Estimating & Costing by Datta
2.Estimating & Costing by Mahajan

CIV- 515T-STRUCTRAL ANALYSIS: III

L-T-P

2-1-0 **Credits: 3**

UNIT I: ENERGY METHODS OF ANALYSIS OF STRUCTURES

Strain Energy Method for analysis of Determinate and Indeterminate Structures; Strain Energy stored due to axial loading, bending, torsion; Principle of Virtual work, Unit load method, Betti-Maxwell's Reciprocal theorem.

UNIT II: ENERGY METHODS OF ANALYSIS OF STRUCTURES: BEAMS AND FRAMES

Castigliano's I^{st} and 2^{nd} theorem of minimum energy and its application to analysis of Internally and Externally indeterminate Beams, Frames. Analysis of curved beams.

UNIT III: ENERGY METHODS OF ANALYSIS OF STRUCTURES: TRUSSES AND ARCHES

Castigliano's I^{st} and 2^{nd} theorem of minimum energy and its application to analysis of Internally and Externally indeterminate trusses and 2 hinged arches, effect of temperature on 2 hinged arches.

UNIT IV: CABLES AND SUSPENSION BRIDGE

Statics of suspension cable, Cables supported at different levels, Temperature effect, Analysis of suspension bridge with and without stiffening girders.

UNIT V: PLASTIC METHOD:

Concept, Assumptions, Shape Factor for different cross- section, Collapse Load, Load Factor, Plastic modulus of a section, Plastic moment of resistance, Theorems of plastic analysis, Methods of analysis, Computation of Collapse load for a fixed beam and continuous beam

BOOKS RECOMMENDED:

1. Indeterminate Structural Analysis by C.K.Wang
2. Indeterminate Structural Analysis by R.L.Jindal.
3. Structural mechanics by Norris and Wilbur.
4. Theory of Structures by S.RamamruthamR.Narayan
5. Analysis of Structures: Thandavamoorthy
6. RC Hibbler- Analysis of Structures

CIV-516T Construction Technology and Management

L-T-P

2-0-0 **Credits: 2**

UNIT I: INTRODUCTION OF CONSTRUCTION PLANNING AND MANAGEMENT

Introduction to construction management, characteristics, importance and objectives of construction management, principles of construction management, function of construction management, introduction to scientific management, bar chart, development of bar chart(illustrative examples), advantages and disadvantages of bar chart, milestone chart and its limitations

UNIT II: DEVELOPMENT AND ANALYSIS OF NETWORK

Introduction to network, network terminology, classification of network, rules for numbering the events, network development, advantages and objectives of network analysis, analysis of PERT and CPM networks (illustrative examples).

UNIT III: COST TIME ANALYSIS IN NETWORK PLANING

Introduction to cost control, objectives of cost control, methods of cost analysis, stages for cost control and cost effectiveness, importance of time cost analysis, project cost and its variation with time, cost optimization with examples

UNIT IV: QUALITY CONSTRUCTION, REGULATIONS AND STANDARDS IN CONSTRUCTION

Basic elements of quality, approaches of quality control, inspection and objectives of inspection, quality audit, quality planning, quality improvement.
Introduction to construction standards, introduction to building codes, objectives of building code, application of building code

UNIT V : CONSTRUCTION CONTRACTS

Introduction, types of contracts, contract document, important conditions of contract
Arbitration, advantages of arbitration, Indian Arbitration Act

CIV-517P GEOTECHNICAL LAB I

L-T-P

0-0-2 **Credits : 1**

LIST OF EXPERIMENTS:

1. Determination of bulk density, water content, and dry density.
2. Particle size distribution by sieve analysis: Dry sieve analysis and wet sieve analysis.
3. Particle size distribution in fine grained soils by hydrometer analysis.
4. Determination of constancy limits: liquid limit, plastic limit and shrinkage limit.
5. Determination of coefficient of permeability of soils by constant head and falling head methods.
6. Determination of O.M.C and M.D.D.
7. Determination of consolidation parameters/characteristics of soil.

CIV -518P-WATER QUALITY LAB

L-T-P

0-0-2 **Credits:1**

LIST OF EXPERMENTS:

1. To determine the total solids, suspended solids and dissolved solids for a given sample of water.
2. To determine the alkalinity of a given sample of water.
3. To determine the total hardness and the carbonate hardness for a given sample of water.
4. To determine the turbidity of a given sample of water.
5. To find the color and odor of a given sample of water.
6. To determine the percentage of Magnesium, Calcium, Iron, Silica and Aluminium in a given sample of water.
7. To determine the percentage of Sulphates, Chlorides, Iodide and Fluoride.
8. To determine the percentage of Na and K in a given sample of water.
9. To determine the concentration of dissolved oxygen in a given sample of water and find out the oxygen consumed.
10. To determine the percentage of Ammonia and Nitrogen present in a given sample of water.

Semester –VI

Semester-VI **Third Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-611T	Design Of Steel Structures-I	2	1	0	45	3
2.	CIV-612T	Geotechnical Engineering-II	2	1	0	45	3
3.	CIV-613T	Transportation Engineering-I	2	1	0	45	3
4.	CIV-614T	Engineering Hydrology	2	1	0	45	3
5.	CIV-615T	Engineering Geology & Seismology	2	1	0	45	3
6.	XXX-xxxT	Elective I (DC)	2	0	0	30	2
7.	CIV-616P	Geotechnical Lab II	0	0	2	15	1
8.	CIV-617P	Transportation Lab	0	0	2	15	1
9.	CIV-618P	Engineering Geology Lab	0	0	2	15	1
10.	CIV-619P	Tour and Training	0	0	2	15	1
11.	YYY-yyyT	Open Elective	*	*	*	30	2
						Total Credits	23

CIV-611T-Design of Steel Structures

L-T-P

2-1-0 **Credits: 3**

UNIT I: CONCEPTS OF DESIGN OF STEEL STRUCTURES

Structural steels and their properties. Working stress and Plastic design concepts. Riveted, bolted and welded connections and their design.

UNIT II: DESIGN OF TENSION MEMBERS

Limit State design of tension members; Design of cables and of other tension members; Codal Provisions.

UNIT III: DESIGN OF FLEXURAL MEMBERS

Design of axial and flexural forces, Design of flexural member: Steel beams, built-up sections. Design of Column Splices and Column Base, Slab Base, Gusseted Base

UNIT IV: DESIGN OF COMPRESSION MEMBERS

Buckling phenomenon of compression members, Design of column bases & grillage foundation of truss members and Purlins.

UNIT V: DESIGN OF ECCENTRIC CONNECTIONS

Design of Bracket type 1 and type 2 -Moment of resistant Connections, 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, Bearings, Transverse stiffeners.

BOOKS RECOMMENDED:

1. Design of Steel structures (Vol I & II) by Ramachandra
2. Design of Steel Structures by Arya &Ajmani
3. Design of Steel Structures by Duggal
4. Design of Steel Structures by Vizrani&Ratwani
5. Design of steel structures by Negi
6. Design of steel structures by Gaylord
7. Design of wooden structures by Donald Breyer, Kinneth Fridley, Kelly.
8. Design of Steel Structures by Subramanyam
   IS code 800-2007.

CIV-612T-GEOTECHNICAL ENGINEERING-II

L-T-P

2-1-0 **Credits 3**

UNIT I: SHEAR STRENGTH

Shear Strength concept, Mohr's Coulomb's equation, laboratory determination. Tri-axial compression test under different Drainage conditions, viz; undrained, drained and consolidated, direct shear test. Vane Shear test. Unconfined compression test. Strength envelope.

UNIT II: BEARING CAPACITY & FOUNDATION

Basic definitions and methods of determination. Prandtl's solution. Terzaghi's solution for ultimate bearing capacity. Size effects. Effects of rigidity of footings. Plate load test.

UNIT III: FOUNDATION DESIGN (GEOTECHNICAL ASPECTS)

Basic terminology, bearing capacity of shallow foundations. Importance and types of foundations. Design principles for footings and rafts. Foundations on clays and sands. Foundations-types and applications. Pile foundation types. Classification and determination of load carrying capacity, dynamic and static methods. Pile load test, pile groups, efficiency of pile groups.

UNIT IV: EARTH PRESSURE AND EARTH STABILIZATION

Lateral earth pressure. Rankine's Theory of Active and Passive states. Lateral earth pressure under various conditions-like surcharge, sloping backfill and high-water table behind the wall. Earth pressure diagrams, total thrust. Tension cracks.

Methods of Stabilization. Brief introduction to each of the methods of the methods of stabilization such as Shotcreting, geo-reinforcement, geo textile .

UNIT V: STABILITY OF SLOPES AND SOIL DYNAMICS

Infinite slopes, conjugate stresses, stability number. Swedish circle methods. Submergence case, complete Draw-down case. Steady seepage case. Introduction to Soil dynamics.

BOOKS RECOMMENDED:

1. Soil mechanics by Alam Singh
2. Soil mechanics & Foundation Engineering by K.R. Arora
3. Soil Mechanics by S.B. Saighal
4. Soil Mechanics and Foundation Engineering by P Purushotham
5. Soil Mechanics and Foundation Engineering Engineering by S.K.Garg

CE613T-Transportation Engineering-I

L –T- P

2– 1-0 **Credits:3**

UNIT-I:

Scope, history, classification of roads. Comparison with other modes oftransportation

UNIT-II:

Alignment design: route survey and highway location. Geometric design: cross section elements; sight distances, horizontal and vertical alignment

UNIT-III:

Pavement design: factors effecting pavement design, types of pavements,
Emperical methods of flexible pavement design (eg C.B.R, GROUP INDEX and Burmister's layer theory) stress due to load and temperature in rigid pavements, introduction to design methods of rigid pavements

UNIT-IV:

Highway materials and construction: Properties and tests for road aggregates and bituminous materials, design of bituminous concrete mix, methods of preparing subgrade, base course and construction of various types of surface covers, joints in cement concrete roads.

UNIT–VI:

Road Making Machinery: Earth work and Road Excavation Machinery, Production of aggregates, Transporting Equipment, Watering Equipment, Compaction Equipment, Bituminous Equipment, Cement Concrete Road Making Equipment.

BOOKS RECOMMENDED:

1. Khanna, S.K. and Justo, C.E.G. 2002. "Highway Engineering".Nem Chand Brothers,Roorkee.
2. Bhanot, K.L.1990. "Highway Engineering", S. Chand and Company (P) Ltd., New Delhi.
3. Rao, G.V. 1996. "Principles of Transportation and Highway Engineering", Tata McGraw Hill, New Delhi
4. Pavement Design and Management Guide by Transportation Association of Canada, Ottawa, Ontario, Edn. Dr. Ralph Haas,

CIV -614T- Engineering Hydrology

L-T- P

2–1- 0 **Credits 3**

UNIT I: HYDROLOGY

Scope and applications of Hydrological cycle; precipitation measurement by rain Guages, gauge network adequacy, missing data determination, and consistency. Hyetographs and methods of determining mean rainfall. Hydrological Abstractions: Evaporation, Transportation, Interception, Depression storage, Infiltration. Water Budget Equation.

UNIT II: STREAM FLOW

Streamflow measurement: Direct and indirect methods, stage□discharge relationship. Factors affecting Runoff. Rainfall-Runoff relationships. Unit Hydrograph, Peak Flow, velocity & Discharge measurements. Hydrographs: Definition, components, base flow separation, effective rainfall, unit hydrograph, its derivation, applications, and limitations.

UNIT III: FLOOD ESTIMATION AND GROUND WATER

Occurrence and distribution of floods; various methods of flood estimation; viz Rational method, empirical methods, U.H. method, Design flood definition. Flood routing: Reservoir and channel routing.

Occurrence and distribution of ground Water, types of aquifers, aquifer properties, Darcy's law, steady one-dimensional aquifer flow, Well Hydraulics: Steady flow to wells in confined and unconfined aquifers

UNIT IV: FLUVIAL HYDRAULICS

Principles of sediment transport, critical tractive force, Shield's plot, Bed and suspended load. Bed movement, White's Theory, Rigid and loose Boundaries.

UNIT V: RESERVOIR DESIGN STUDIES

Types of reservoirs, storage capacity, Mass-curve technique, fixation of capacity, safe yield, reservoir sedimentation: trap efficiency, capacity-inflow ratio, life of reservoirs

BOOKS RECOMMENDED:

1. Irrigation, Water Power & Water Resources Engineering by K.R.Arora
2. Engineering hydrology by K Subramanya
3. Engineering Hydrology by EM Wilson
4. Mechanics of sediment transportation and alluvial stream problems by RJ Garde& KG Rangaraju
5. Hydrology Principles Analysis & design by HM Ragunath
6. Applied Hydrology by K Linsley, A Kohler, LH Paulhus
7. Hydrology &Water Resources Engineering by SK Garg

CIV-615T-Engineering Geology & Seismology

L-T-P

2 -1-0 **Credits: 3**

UNIT I:

Geology and its relevance to civil engineering, Structural Geology; Folds, Faults and Mechanism of Faulting, Joints, Unconformities.

UNIT II:

Engineering Geology; geological considerations in tunnels, dams, bridges, building sites; landslides.

UNIT III:

Earthquakes; types and causes, distribution in the world, basic definitions, seismic zones.

UNIT IV:

Introduction to Seismic Hazards and Earthquake Phenomenon. Geographical Distribution of Earthquakes and Seismo-tectonics.

UNIT V:

Earthquake recording instruments, Warning systems, Global network, Monitoring of Earthquakes.

BOOKS RECOMMENDED

1) Engineering Geology by Parbin Singh
2) Physical Geology by Arthur Holmes
3) Engineering Geology by F.G. Bell
4) Engineering Seismology by PN Aggarwal.
5) An introduction to Seismology, Earthquakes & Earth Structures by Sethstein& Michael Wysession

CIV-616P-Geotechnical Laboratory II

L – T-P

0 -0-2 **Credits: 1**

LIST OF EXPERIMENTS:

1. Shear strength tests:
   a. Unconfined Compression Test
   b. Direct Shear Test
   c. Tri-axial Compression test (UU)
   d. Vane Shear Test.

Conduct and determination of Shear Parameters.

2. Conduct of Plate Load Test
3. Conduct of SPT
4. Sub-soil exploration by electric resistivity method

CIV-617P -Transportation Laboratory

L- T- P

0 - 0- 2 **Credits:1**

LIST OF EXPERIMENTS:

1.TESTS ON AGGREGATE-

a) Aggregate grading
b) Specific Gravity
c) Crushing
d) Abrasion
e) Impact
f) Soundness
g) Flakiness
h) Shape
i) Fineness Modulus
j) Silica content
k) Silt content,
l) Alkalinity.

2. TESTS ON BITUMEN-

a) Viscosity
b) Penetration,
c) Softening point
d) Flash & Fire Point.
e) Ductility,
f) Specific gravity,
g) Elastic recovery
h) Marshall stability

3.TESTS ON SUB-GRADE-

a) Sub-grade Modulus
b) CBR.

Books recommended:

1. Khanna, S.K. and Justo, C.E.G. 2002. "Highway Engineering". Nem Chand Brothers, Roorkee

2. Highway Materials and Pavement Testing by Khanna, Justo &Veeraragavan, Nem Chand Brothers, Roorkee

3. Material Testing Laboratory Manual by Kukreja, Kishore &Chawla, Standard Publishers, NaiSarak, Delhi

CIV-618P-ENGINEERING GEOLOGY LAB

L-T-P

0-0-2 **Credit: 1**

LIST OF EXPERIMENTS:

1. The study of Physical Properties of Minerals.

2. Determination of specific Gravity by:

a) Jolly's Spring Balance

b) Walker's Steel Yard Balance

c) Beam Balance

3. Study of Rocks and their characteristics.

4. Study & Sketching of various types of Geological structures.

5. Study the parts of Clinometer.

CIV 619-P Tour and Training

L-T-P

0-0-2 **Credit: 1**

The students shall go for tour & training to study an ongoing project work in the state or outside so as to acquaint themselves with the latest technologies in engineering. The students are required to submit a detailed tour & training report and shall submit the same to the evaluation board to be constituted by the HOD.

The weightage shall be as follows:

i) Expert/supervisor (From the department) = 40 %
ii) Project Report = 20 %
iii) HOD/Board/Viva = 40 %

Semester –VII

Semester-VII **Fourth Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-711T	Design Of Concrete Structures-II	2	1	0	45	3
2.	CIV-712T	Irrigation & Hydraulic Structures	2	1	0	45	3
3.	CIV-713T	Waste water Engineering	2	1	0	45	3
4.	CIV-714T	Railway and Airport Engineering	2	1	0	45	3
5.	XXX-xxxT	Elective II (DC)	2	0	0	30	2
6.	XXX-xxxT	Elective III (DC)	2	0	0	30	2
7.	YYY-yyyT	Open Elective	*	*	*	30	2
8.	CIV-715P	Pre Project	0	0	4	30	2
9.	CIV-716P	Seminar	0	0	2	15	1
						Total Credits	21

CIV-711 T-Design of Concrete Structures-II

L-T-P

2-1-0 **Credit: 3**

UNIT I: FOUNDATIONS

Various types of RCC footings, Design of combined footings. Introduction to Raft foundation and design procedure as per IS: 456-2000.

UNIT II:RETAININGWALLS

Stability analysis of retaining walls, design of cantilever and counter-fort type RCC retaining walls.

UNIT III: WATER RETAINING STRUCTURES

Design of underground, circular & rectangular water tanks with reference to IS: 3370.

UNIT IV: SHELL STRUCTURES

Membrane analysis of spherical & conical domes by statical methods. Design of domes & ring beams. Analysis of Plate structures.

UNIT V:PRE-STRESSED CONCRETE

General principles, methods of pre-stressing, pre-tensioning & post-tensioning, losses in pre-stress. Design of rectangular, T & I section beams.

BOOKS RECOMMENDED

1. Design of footings by Kurien
2. Design of RCC structures by Jain & Jai Krishan
3. Pre-stressed concrete structures by Krishna Raju
4. Relevant IS codes & specifications

CIV-712T-Irrigation& Hydraulic Structures

L-T-P

2-1-0 **Credit: 3**

UNIT I: GENERAL INTRODUCTION

Necessity of Irrigation in India, advantages and disadvantages of Irrigation, Techniques of water distribution in farms, Soil moisture &crop water requirements; Duty, Delta, Base period, crop period, Consumptive use, irrigation requirements.

UNIT II: CANAL IRRIGATION

Types of canals, parts of canal irrigation system, channel alignment, assessment of water requirements, distribution system of canal irrigation estimation of channel losses; design of channels by regime & semi-theoretical approaches; canal lining

UNIT III: CROSS DRAINAGE WORKS

Necessity of Cross Drainage works, their types & selection; Design of various types of Cross Drainage works- Aqueduct, Syphon Aqueduct, Super passage, siphon, siphon super passage, Level Crossing.

UNIT IV: DIVERSION HEADWORKS

Parts of diversion headworks, types of weirs and barrages, introduction to design of weirs on permeable foundations, control of silt entry into canal, silt excluders & their types. bligh's theory and khoslas theory.

UNIT V: WATER LOGGING & FLOOD CONTROL

Causes & preventive measures of water logging, Drainage of irrigated lands, saline & alkaline lands. Flood problems, types of floods, Flood control measures.

BOOKS RECOMMENDED

1. Arora, K.R. " Irrigation Water power & water Resources Engineering", standard publishers Distributors, Delhi, 2002.
2. B. Singh, *Irrigation Engineering*, Nem Chand and Sons, Roorkee.

SUPPLEMENTARY READING:

1. Varshney& Gupta, *Theory and Design of Irrigation Structures*, Nem Chand and Bros, Roorkee.
2. I. E. Hook, *Irrigation Engineering*, John Wiley and Sons, New York.
3. J. D. Zimmerman, *Irrigation*, John Wiley and Sons, New York.

CIV 713T- WASTE WATER ENGINEERING

L-T-P

2- 1-0 **Credits: 3**

UNIT I: ENVIRONMENT

Importance of clean Environment, co existence, habitat and eco systems. Sources of pollution to Land, Water and Air. General effects of pollution. Pollution by sewage. Nature and types of sewages (domestic, Industrial etc)

UNIT II: SEWAGE DISPOSAL

Methods of sewage disposal, effects of disposal on land and in water bodies, Self purification of streams, BOD calculations, Design of sewers, Types of sewers.

UNIT III: SEWAGE TREATMENT

Unit operations in Sewage treatment, screening, grit removal, sedimentation, filtration, Activated sludge process. Septic and Imhoff tanks, soakages for isolated systems.

UNIT IV: SOLID WASTE MANAGEMENT

Solid waste management, Constituents of solid waste, Sanitary land filling, Composting, Incineration

UNIT V: POLLUTION AND PREVENTIVE MEASURES

Air pollution, Air quality standards, measurement of air pollution, factors responsible for pollution, engineering measures to check air pollution. Electrostatic precipitators. Noise pollution .Measurement and preventive measures. Water pollutions, causes and preventive measures. Soil pollution.

BOOKS RECOMMENDED:

1. Modi P. N.," Waste water Treatment" 2005
2. McGhee, T.J., "Water Supply and Sewerage", McGraw Hill 1991
3. Hammer, M.J. and Hammer M.J., " Water and Waste WaterTechnology" Prentice Hall of India2000
4. Nathanson J.A. " Basic Environmental Technology" 5th Ed. 2009
5. Viessman W. and Hammer M.J. " Water Supply and PollutionControl" 6th Ed. Addison Wesley Longman.

CIV-714T Railway and Airport Engineering

L – T-P

2 –1- 0 **Credits: 3**

UNIT I: TRANSPORTATION SYSTEM

Importance of transportation systems, history of railways and its development, development of Indian railways.

UNIT II: PERMANENT WAY

Permanent way and its component parts, formation, ballast, sleepers, rails. Creep and tilt in rails.

UNIT III:RAILWAY TRACKS

Track resistance and tractive effort, gauge problem, super- elevation near branching of curves,gradients. Track fittings and fastenings, points and crossings, station Platforms, yards and sidings.

UNIT IV:AIRPORT

Classification of airports; planning, surveys and site selection of airports; Airport geometrics: runway length and patterns & orientation, wind rose diagram, width and grades of runway, taxiways and aprons.

UNIT V: AIRPORT PAVEMENT DESIGN

Airport pavement design: difference between highway and airport pavements, introduction to various design methods, airport drainage.

BOOKS RECOMMENDED:

1. Rangawala, S.C. 2002. “Railway Engineering”, Charotar Publishers, Anand
2. Arora, S.P. and Saxena. 2001. “ Railway Engineering” , Dhanpat Rai Publishers, New Delhi.
2. Khanna, Arora and Jain. 2002. “Airport Planning and Design”, Nem Chand and Brothers, Roorkee.
3. Horren Jeff. “Airport Planning and Design

CIV-715P-Pre-Project

L – T-P

0 –0-4 **Credits: 2**

A project will be assigned to the students & the students shall start working on the project assigned to them under internal & external guides. The students shall have to submit an acknowledgement from the agency executing the project & the project shall be duly approved by the project approving authority from the department. At the end of the semester a preliminary synopsis report on the project shall be submitted to the Department for assessment.

The students are required to appear for viva voce which shall be conducted in the department, in presence of the faculty members under the supervision of the HOD.

CIV-716P- Seminar

L-T-P

0-0–2 **Credits:1**

A seminar shall be organized at the 7th semester of the Civil Engineering curriculum leading to the Degree of B. Tech. The students shall do research on a topic of their choice which may be either library research and/or laboratory research. The students shall be guided in their research work by the staff members of the department. The students shall make a power-point presentation of 15-20 minutes duration on the research work in front of their fellow students under the supervision of the staff members of the department. A discussion on the talk follows the presentation.

The students shall make a hard-copy of their seminar report & present it before the intended date of the presentation.

Semester –VIII

Semester-VIII **Fourth Year**

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1.	CIV-811T	Design Of Bridge Structures	2	1	0	45	3
2.	CIV-812P	Project	0	0	16	90	8
3..	XXX-xxxT	Elective IV(DC)	2	0	0	30	2
						Total Credits	13

CIV-811 T- Design of Bridge Structures

L-T-P

2-1-0 **Credits: 3**

UNIT I: INTRODUCTION TO BRIDGES

Introduction to bridges and types of bridges, History and development of bridges, Bridge components; Various types of Loads on bridges, Standard loadings for highway; Introduction to Hydraulic Design of Bridges, Scour depth, Afflux, stream flow (discharges) measurements; Introduction to Sub-structure of Bridge and types of loads on sub-structure.

UNIT II: DESIGN OF RCC CULVERTS

Introduction to culverts, Types of culverts, components of culverts, Design principles for culverts, Design of solid slab culvert.

UNIT III: DESIGN OF TRUSS BRIDGES

Various forms of steel trussed bridges, Analysis and Design of trussed bridges based on standard IRC loading; Design of Stringers and Cross Girders for single & multi-lane bridges for standard IRC loadings.

UNIT IV:DESIGN OF PLATE GIRDER BRIDGES

Analysis and Design of Plate Girder Bridges, Composite bridges.

UNIT V: DESIGN OF BRIDGE DECK SLABS

Analysis and Design of RCC bridge deck slabs; Courbon's Method of Bridge Deck Analysis.

BOOKS RECOMMENDED:

1. Design of Bridges by John victor
2. Design of Bridges by Krishna Raju
3. Design of Masonry& timber structures by A.S. Arya
4. Relevant IRC/IS codes & specifications.

CIV-812T-Project

L- P-T

0-0-16 **Credits: 8**

The project assigned to the group of students at the 7th semester level will have to be completed at the 8th semester. It may require complete field survey, a design & calculations of various structures associated with the project, comparative economic studies, preparations of estimates, laboratory/experimental work etc.

On completion of the project work, a detailed technical report is to be submitted by every student in accordance with the standards adopted for technical report. There will be a viva - voce examination after the submission of the technical report. The H.O.D. would constitute a project evaluation board which will assess the individual project work. The weightage will be as follows:

i) Supervisor or Internal guide (From the department) = 40 %
ii) Project Report = 20 % (To be assessed by the evaluation board).

Evaluation board assessment will be done by internal expert/supervisor & the external expert in the ratio of 1:1.

iii) Presentation & viva-voce = 40 %.

The evaluation board will comprise of supervisor, internal expert & one subject expert preferably from outside the University.

CIV-E01T-Architecture & Town Planning

L-T-P

2-0-0 **Credits 2**

UNIT I: ARCHITECTURE

Architecture & Civil Engineering, classical Architecture, contemporary Architecture, General aspects of Architectural projects.

Architectural planning and design-Introduction, factors affecting Architectural Design, principles of Architectural design, organization of space, space standards, modular co- ordination.

UNIT II: FUNCTIONAL ANALYSIS

Analytical study of Buildings in respect of functional efficiency, Architectural efficiency, Building Science, environmental controls-both exterior and interior, physical and economic constraints with respect to residential and Public buildings, Dhajji Dewari and Takh System.

UNIT III: ARCHITECTURAL PLANS AND PROJECTS

Introduction to Architectural plans, preparation and reading of architectural plans, analytical study of various works/projects of some architects like LE Corbusier, Philip Jhonson, F.L.Wright, etc.

UNIT IV: TOWN PLANNING

Planning at various levels-national, regional, city, village. Origin & growth of towns, Horizontal and Vertical development.
Brief historical review of some ancient towns, present day planning in India.

UNIT V: MASTER PLAN & ZONING

Importance of Master Plan for redevelopment of existing towns & planning of new towns, implementation, building Bye-Laws, concept of Red-hood Neighbourhood Pattern.Zoning Regulation for various urban land uses including density and height zoning, multi- story buildings and their implications on urban planning.

BOOKS RECOMMENDED-

1. Architectural Design by KR Moudgil
2. Town Planning by Rangawala
3. Town Design by Fredrick Gibberd
4. New concepts in Architecture & design by Yoshikawa

CIV-E02T Geo-Environmental Engineering

L-T-P
2-0-0 **Credits:2**

UNIT-I

Introduction and Soil-water-environment interaction : Introduction to geoenvironmental Engineering, Soil-water-environment interaction relating to geotechnical problems, Waste:-source, classification and management of waste, Physical, chemical and geotechnical characterization of municipal solid waste, Impact of waste dump and its remediation

UNIT-II

Geotechnical application of waste and disposal: Geotechnical use of different types such as Thermal power plant waste, MSW, mine waste, industrial waste. Waste disposal facilities, Parameters controlling the selection of site for sanitary and industrial landfill. Site characterization. MoEF guidelines.

UNIT-III

Landfill Components :Landfill layout and capacity, components of landfill and its functions. Types and functions of liner and cover systems, Compacted clay liner, selection of soil for liner, methodology of construction.

UNIT-IV

Leachate, Gas Management and Geosynthetics: Management of Leachate and gas. Various components of leachate collection and removal system and its design., gas disposal/utilization. Closure and post closure monitoring system Geosynthetics- Geo membranes - geosynthetics clay liners -testing and design aspects.

UNIT-V

Soil remediation : Investigation of contaminated soil, sampling, assessment Transport of contaminants in saturated soil. Remediation of contaminated soil- in-situ / exit remediation, bio remediation, thermal remediation, pump and treat method, phyto remediation and electro-kinetic remediation

BOOKS RECOMMENDED-

1. Daniel, D.E. (1993). Geotechnical Practice for Waste Disposal. Chapman, and Hall, London.
2. Koerner, R.M. (2005). Designing with Geosynthetics. Fifth Edition. Prentice Hall, New Jersey.
3. Reddi L.N and Inyang HI (2000) Geoenvironmental Engineering: Principles and Applications, Marcel Dekker Inc Publication
4. R. N. Yong (2000) Geoenvironmental Engineering: Contaminated Soils, Pollutant Fate, Mitigation Lewis Publication.
5. Dr. G V Rao and Dr. R S Sasidhar (2009) Solid waste Management **and** Engineered Landfills, Saimaster Geoenvironmental Services Pvt. Ltd. Publication.
6. Ayyar TSR (2000) Soil engineering in relation to environment, LBS centre for Science and Technology, Trivandrum.

CIV-E03T-Advanced Structural Analysis

L-T-P

2-0-0 **Credits 2**

UNIT I: PLASTIC METHOD

Concept, Assumptions, Shape Factor for different cross sections, Collapse Load, Load Factor, Plastic modulus of a section, Plastic moment of resistance, Computation of Collapse load for a fixed beam and continuous beam.

UNIT II: MATRIX METHODS OF STRUCTURAL ANALYSIS

Introduction to matrices and properties of matrices, Concept of Matrix Method & Flexibility Method. Formulation of Stiffness matrix for simple Planar Elements- Trusses & Beams.

UNIT III: APPLICATION OF MATRIX METHODS

Analysis of Planar Trusses (basic), Beams (basic) and Frames (basic) using stiffness method.

UNIT IV: FINITE ELEMENT METHOD AND ITS APPLICATIONS

Introduction to Finite Element Method of Structural Analysis. Review of principle of Virtual work. Formulation of Element Stiffness Matrix for 1D Bar & Beam Element. Application of Finite Element Method of structural Analysis to beams and Trusses. (subjected to simple loading-concentrated load & udl)

UNIT V: INFLUENCE LINES DIAGRAMS FOR INDETERMINATE STRUCTURES

Principles of Influence Lines for indeterminate Structures; Beams, Arches. Muller-Bresslau Principle, Criteria for maximum moment & shear under series of moving concentrated loads in beams.

BOOKS RECOMMENDED:

1. Finite Element Method by Deb Debasis
2. Theory of Structures by Ramamurathan
3. Matrix Analysis of Framed Structures by Harry H.West
4. Concepts & Applications of Finite Element Analysis by Robert D Cook
5. Basic Structural Analysis by CS Reddy

CIV-E04T -Structural Dynamics

L-T-P

2- 0- 0 **Credits: 2**

UNIT I: Dynamics of structures

Introduction to dynamic loads (earthquake and blast loading) types of dynamic loads, basic background of dynamics- Methods available (D'Alembert principle, Newtons third law) basic review of stiffness of structures, development of equations of motion (problem statement and solution method)

UNIT II: Dynamics of SDOF

Dynamic equation of equilibrium, free vibration of SDOF (damped and undamped) systems, Models for Energy loss, Dynamic characteristics of system, Force transmission and vibration isolation, Forced vibrations, harmonic and periodic loading, SDOF response to arbitrary functions, Duhamel's integral.

UNIT III: Numerical Evaluation

Numerical Evaluation of dynamic response; Time stepping methods central difference method and Newmark's method.

UNIT IV: Dynamics of MDOF

Dynamic equations of equilibrium, undamped systems, natural modes and their properties, eigen value problem, solution of free vibration response for undamped systems, orthogonality relationship of principal modes, dynamic response by mode superposition method, General approach of linear systems; static condensation

UNIT V: Earthquake Response of SDOF system

Earthquake excitation, Response history and construction of Response spectra, Response spectrum characteristics, tripartite plot and design spectrum, Introduction to Earthquake codes

BOOKS RECOMMENDED

1. Dynamics of structures by Anil K. Chopra
2. Dynamics of structures by Clough & Penzien
3. Structural Dynamics by Mario Paz

SUPPLEMENTARY READING:

1. S. P. Timoshenko and D. H. Young, Vibration Problem in Engineering, D. Van -Nostrang Company. Inc. Affiliated East-West Press Pvt. Ltd., New Delhi

CIV-E05T-Transportation Planning & Economics

L-T-P

2- 0- 0 **Credits: 2**

UNIT I:

Introduction and scope of transportation planning and transportation economics, transportation planning issues.

UNIT II:

Public Transportation: public transport modes, desirable characteristics of public transport systems, transit system operations, route development, stopping policy, stop location, scheduling, capacity of transit systems, socially optimal pricing

UNIT III:

Transport analysis and forecasting: transport planning process, transportation and land use, transport planning strategies, transport planning models, travel demand analysis, operational transportation and land use models.

UNIT IV:

Transport economics and finance: pavement economics- construction cost; maintenance cost and vehicle operation cost, economic evaluation of highway projects- basic principles

UNIT V:

Time value of money; costs and benefits; net present value (NPV) method; benefit-cost (B/C) ratio method; internal rate of return (IRR) method; comparison of evaluation techniques, freight transport-trends and economic growth.

BOOKS RECOMMENDED:

1. Transport Planning and Traffic Engineering by CA O'Flaherty, John Wiley & Sons, Inc., New York; Toronto.
2. Transportation Engineering and Planning by Papacostas & Prevedouros, Prentice-Hall of India Private Ltd, New Delhi-110001
3. Principles of Transportation Engineering by Chakarborty & Das, Prentice-Hall of India Private Ltd, New Delhi-110001
3. Urban Transportation Planning by Meyer & Miller, McGraw Hill, New Delhi

MTH-E01T Operation Research & Optimization

L-T-P

2–0-0 **Credits: 2**

Unit I: Introduction

Introduction to operation Research, Linear Programming problem â €.Formulation of LPP, Graphical solution of LPP, simplex method, artificial variables, big-M method.

Unit II:Transportation Problems

Formulation, solution of balanced transportation problem. Finding intial basic feasible solutions â €. North-west corner rule, least cost method and Vogoles approximation method.

Unit III: Assignment Model and Hungarian method

Assignment Model Formulation, Hungarian method for optimal solution; solving unbalanced problems; travelling salesman problem and assignment.

Unit IV: Sequencing Models

Solution of sequencing problem â €; processing n jobs through two machines, â € processing n jobs through three machines â €; Processing two jobs through m machines.

Unit V: Dynamic Programming

Introduction to Dynamic programming problems, Characteristics and applications of Dynamic Programming, Mathematical formulation and optimal Solution of Dynamic Programming problems.

BOOKS RECOMMENDED:

1. P. SankaraIyer, â € Operations Research, Tata McGraw Hill 2008
2. A.M. Natarajan, P.Balasubramani, A. Tamilarasi, â € Operations, Pearson Education, 2005.

CIV-EO6T- Hydropower Engineering

L-T-P

2 -0-0 **Credits: 2**

UNIT I: GENERAL INTRODUCTION

Development of water power, Estimation of Hydropower potential, Comparison of hydro, thermal & nuclear power.

Classification of hydro-power plants.

UNIT II: ANALYSIS OF STREAM FLOW & DEMAND

Flow duration curve, firm power, secondary power, load & Load duration curves, load factor etc.

UNIT III: WATER CONVEYANCE SYSTEM

Power canals, Alignment, Design of power canals, flumes, covered conduits & tunnels. Penstocks- Alignment, types of penstocks, Economic diameter of penstocks, Anchor blocks.

UNIT IV: DAMS

Selection of site, Preliminary investigations, Final investigations.

Rigid Dams: Basic principles of design & details of construction.

Embankment Dams: Earthen dams, rock-fill dams, design Considerations.

Spillways: Types of spillways, Spillway gates, Design of stilling basins.

UNIT V: POWER HOUSE DETAILS

Forebay, intakes, General layout of power house & arrangement of hydropower units; Underground power stations.

BOOKS RECOMMENDED:

1. Dandekar, M.M. "Water Power Engineering".
2. Deshmukh, M.M. "Water Power engineering", DanpatRai & Sons, New Delhi.
3. Arora, K.R. "Irrigation, Water Power & Water Resources Engineering",Standard Publishers Distributors, Delhi.

CIV-E07T Earthquake Resistant Design

L-T-P

2–0-0 **Credits:2**

UNIT I:
Introduction to earthquakes, Acceleration time history, Response spectrum, Design spectra

UNIT II:
Response of buildings subjected to ground motion based on modal analysis.

UNIT III:
Seismic design of R.C.C. structures (up to 2-storey Buildings) based on Codal provisions IS: 1893.

UNIT IV:
Detailing of RCC Elements as per IS: 13920.

UNIT V:
Seismic Codal provisions of brick masonry structures.
Repair & seismic strengthening of buildings as per IS: 13935.

BOOKS RECOMMENDED:

1. Dynamics of structures by Anil K Chopra.

2. Seismic design of structures by Pankaj Aggarwal, Shrikhande.

3. Seismic design of RCC & Masonry structures by Pauley, T & Priestley.

4. Fundamental Concepts of Earthquake Engineering by Roberto Villaverde.

CIV-E08T-Pre-Stressed Concrete

L-T-P

2-0-0 **Credits: 2**

UNIT I: INTRODUCTION

Basic concept of prestressing – Advantages of prestressed concrete over reinforced concrete – materials for prestressed concrete and their characteristics. Uniform prestress distribution in prestressed concrete – non-uniform prestress distribution – moments of resistance.

UNIT II: SYSTEMS OF PRESTRESSING & LOSSES IN PRESTRESS

Tensioning devices, Pre-tensioning systems, post-tensioning systems, thermo-electric prestressing, chemical prestressing; Nature of prestress losses, Losses due to: Elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, anchorage slip. Total losses allowed for in Design.

UNIT III: ANALYSIS OF MEMBERS

Analysis of pre-stressed structural members for axial loads, flexure, shear & torsion. Analysis calculations for various elements.

UNIT IV: LIMIT STATE DESIGN CRITERIA FOR PRESTRESSED CONCRETE MEMBERS

Inadequacies of the Elastic & Ultimate Load Methods, philosophy of Limit state Design, Criteria for limit states, Design Loads & Strengths, Strength & serviceability Limit States, Principles of Dimensioning Concrete Members.

UNIT V: DESIGN OF PRESTRESSED CONCRETE SECTIONS

Design of Pre-stressed sections for flexure, axial tension, shear & Torsional forces. Combination of stresses.

BOOKS RECOMMENDED:

1. N. Krishna Raju, Prestressed Concrete, Tata McGraw Hill Publishing Co. Ltd, New Dehi.
2.S K Mallick, A P Gupta, Prestressed concrete, Oxford and IBI Series.
3.R. H. Evans, Bennet E W, Prestressed concrete theory and design, Chapman and Hall, London.T. Y. Lin, Design of Prestressed Concrete Structures, Asia Publishing House