Civil Engineering

5th semester -Course Structure

Sl.no.	Course no.	Subject	L	T	P	Credit
1	CEC501	PC-I – Steel Structure& Design	3	1	0	4
2	CEC502	PC-II -Geotechnical Engineering-I	2	1	0	3
3	CEC503	PC-III - Environmental Engineering	2	1	0	3
4	CEP(504-510)	PE-I -	2	1	0	3
5	CEO(511-516	OE-I -	2	1	0	3
Laboratory/Sessionals						
1	CE501P	Sessional- Steel Design Lab	0	0	2	1
2	CE502P	Sessional- Geotechnical Engineering Lab	0	0	2	1
3	CE503P	Sessional- Environmental Engineering Lab	0	0	2	1
4	CE504P	Field Survey	0	0	2	1
5	CE505G	General Proficiency/Seminar	0	0	2	2
TOTAL CREDIT						**22**

PROFESSIONAL ELECTIVE – I

[CEP504] Water Resources Engineering -I
[CEP505] Earthquake Engineering
[CEP506]Environmental Geo-technology
[CEP507] Advance Surveying
[CEP508] Water resources system
[CEP509] IndustrialStructure
[CEP510] DesignofStructural System

OPEN ELECTIVE – I

[CEO511] EnvironmentalImpact Assessment
[CEO512] Reliability Engineering
[CEO513] Global Positioning System
[CEO514] Disaster Management
[CEO515] Environmental Management System
[CEO516] Advanced Engineering System
[HMO501] Human Resource Development and Organisational Behaviour
[HMO502] Cyber Law and Ethics

Civil Engineering

6th semester -Course Structure

Sl.no.	Course no.	Subject	L	T	P	Credit
1	CEC601	PC-I - Concrete Structure-II	3	1	0	4
2	CEC602	PC-II - Structural Analysis-II	2	1	0	3
3	CEC603	PC-III - Highway Engineering	2	1	0	3
4	CEP(604-609)	PE-I -	2	1	0	3
5	CEO(610-615	OE-I -	2	1	0	3
Laboratory/Sessionals						
1	CE601P	Sessional- ConcreteDesign Lab	0	0	2	1
2	CE602P	Sessional- Structural EngineeringLab	0	0	2	1
3	CE603P	Sessional- Transportation Engineering Lab	0	0	2	1
4	CE604P	C.S.Q.A.	0	0	2	1
5	CE605I	Tour&Training/Internship	0	0	2	2
TOTAL CREDIT						**22**

PROFESSIONAL ELECTIVE – I

[CEP604]Water Resources Engineering-II
[CEP605] Pavement Design
[CEP606] Bridge engineering
[CEP607] Structural Dynamics
[CEP608]System Engineering &Economics
[CEP609] Masonry Structure

OPEN ELECTIVE – I

[CEO610] Industrial Waste Treatment
[CEO611] Composite Material
[CEO612] Environmental Laws and Policy
[CEO613] Operational Research Technique
[CEO614] Value and Ethics in engineering
[CEO615] Decision and Risk Analysis

PROFESSIONAL CORE – I

CEC501	STEEL STRUCTURE &DESIGN	PC – I	3-1-0	4 Credits

Pre-requisites: None

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Introduction to steel structures and IS 800-2007- Material specifications - Rolled sections – Section classifications - Design approach; design philosophy, i.e. loading load combination, factor of safety, permissible and working stress elastic method, limit state of design, plastic design, Elements of plastic theory: - Plastic hinge, shape factor, collapse load for beams & portal frame. Uniqueness, upper & lower bound theorem. Effect of axial force & shear in plastic moment ofsections.	12
2.	Connections: riveted, bolted and welded connections, strength and efficiency, Eccentric connection	12
3.	Tension member: rolled sections and built-up sections,	8
4	Compression members - Slenderness ratio – Design - Simple and built- up sections - lacings and battens - Tension members.	10
5.	Flexural members – Rolled sections - built-up beams - Design for strength and serviceability, web crippling, webyielding, bearing stiffeners,	10
6.	BEAM column: stability consideration, interaction formulae and Column bases: stability of base, gusseted base and grillage footing	8

Plate Girder, Gantry Girder,

Reading:

1. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi2008.

2. Dayaratnam P, Design of Steel Structures, S. Chand & Co., New Delhi,2003.

3. Arya, A.S and Ajmani, A.L., Design of Steel Structures, Nemchand and brothers, Roorkee, 1992..

4. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain. Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., New Delhi2000.

5. IS 800-2007, Code of practice for general construction in steel, Bureau of Indian Standards, NewDelhi.

PROFESSIONAL CORE – II

CEC502	Geotechnical Engineering-I	PC – II	2-1-0	3 Credits

Pre-requisites: None

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	**Engineering Properties and Classifications** Laboratory and field identification of soils: Determination of water content by oven drying– specific gravity using Pycnometer and specific gravity bottle – grain size analysis by sieveanalysis, hydrometer analysis and pipette analysis – Atterberg limit and indices, sensitivity &thixotropy field density by core cutter, sand replacement and wax coating methods.Permeability: Definition - Darcy's law - factors affecting permeability – laboratorydetermination – permeability of stratified soils. Classification of Soils: Necessity – Principles of classification – I.S. classification – plasticitychart.	10
2.	**Stress Distribution in Soils** Stress distribution: Boussinesque's and Westergaard's equations for vertical pressure due topoint loads and uniformly distributed loads - assumptions and limitations - pressure bulb – Newmarks` charts and their use	4
3.	**Compressibility of Soils** Consolidation: definition - concepts of coefficient of compressibility - coefficient of volumechange and compression index - e-log p curves - pre-consolidation pressure - Terzaghi'stheory of one-dimensional consolidation - determination of coefficient of consolidation -difference between consolidation and compaction Compaction: definition and objectives of compaction - proctor test and modified proctor test- concept of OMC and maximum dry density - zero air voids line - factors influencingcompaction - field compaction methods - Proctor needle for field control	12
4	**Shear Strength and Stability of Slopes:** Shear Strength: definition - Mohr's strength and stress circles - Mohr's envelope – MohrCoulomb strength theory - direct, triaxial and UCC tests - drainage conditions-UU, CU andCD tests - vane shear tests - total and effective stress - strength parameters Stability of slopes: slope failure, base failure and toe failure - Swedish circle method -friction circle method - Taylor's stability number - stability charts	8
5.	**Retaining Walls :** Retaining walls, Active, neutral and Passive earth pressures and their distributions, rigid and flexible retaining walls,	6

	Coulomb's and Rankine's earth pressure distribution, Tension cracks, depth of tension cracks, Critical depth of excavation	
6.	**Sub-surface Exploration :** Subsurface exploration and investigation: Preliminary and detailed investigation, Soil sampling and various terms such as clearance and recovery ratio, auguring and boring, Penetration tests such as SPT, CPT, SCPT	**4**

PROFESSIONAL CORE – III

CEC503	**ENVIROMENTAL ENGINEERING**	**PC – III**	**2-1-0**	**3 Credits**

Pre-requisites:None

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Water demand: - Population- forecast, design period, factors affecting populations growth, water demand, factors affecting rate of demand, variations in rate of demand.	**8**
2.	Quality of water: - sources of impurities, common impurities in water and their effect, water analysis, physical, chemical and biological characteristics, water borne diseases, Indian andWHO drinking standard.	**8**
3.	Purification: Sedimentation, flocculation, coagulation, filtration, disinfection, water softening, aeration, miscellaneous treatment method.	**8**
4.	Distribution of water: - Introductions , Methods of distribution, pressure in distribution mains, system of water supply, storage and distribution reservoir, layout and design of distribution system and distribution reservoir.	**12**
5.	Waste water treatment: - Sewage characteristics. Sewerage system: - Type, design, construction and maintenance. Treatment :- Primary and secondary treatments, screens, grit chamber, sedimentation chamber, principle and design of activated sludge digestion, final disposal of sludge and effluents, Disposal of sewage by dilution, self-purification of streams, sewage disposal by irrigation, waste water reuse, solid waste collection, re-utilization/disposal, B.O.D, C.O.D.	**12**

Reference Books

1. G.B. Masters, Introduction to Environmental Engineering and Science, Pearson Education,2013.
2. Gerard Kiely, Environmental Engineering, McGraw Hill Education Pvt Ltd, Special Indian
   Edition, 2007.
3. W P Cunningham, M A Cunningham, Principles of Environmental Science, Inquiry and Applications, Tata McGraw Hill, Eighth Edition,2016.
4. M. Chandrasekhar, Environmental science, Hi Tech Publishers,2009

PROFESSIONAL ELLECTIVE – I

CEP504	WATER RESOURCES ENGINEERING – I	PE – I	2-1-0	3 Credits

Prerequisite: Fluid Mechanics

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	**Introduction -** Hydrologic cycle, water-budget equation, history of hydrology,worldwaterbudget,WaterbudgetofIndia,Organization preserving hydrological data,	4
2.	**Precipitation –** types and forms of precipitation, different characteristics of rainfall and their representation, measurement of rainfall , rain gauge network, mean precipitation over an area, depth area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India	8
3.	**Abstractions from precipitation -** evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration,evapotranspiration equations, potential evapotranspiration, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, infiltration capacity curve, classification of infiltrationcapacities, infiltration indices	10
4.	**Runoff** –components ofrunoff Estimation of run off, SCS-CN method of estimating runoff, flow duration curve, flow-mass curve, Different types ofindices.	4
5.	**Hydrograph:** Elements of storm hydrograph, simple and complex storm hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph, Derivation of unit hydrograph from S - Curve technique, SUH and IUH.	10
6.	**Floods estimation and Flood Routing:** Estimation of peak discharge, rational method, SCS method and unit hydrograph method, Design flood, return period, flood frequency analysis, concepts of flow routing, Different methods of routing,PMF,SPF	8

Reading:

1. 1.KSubramanya, Engineering Hydrology, Mc-GrawHill.
2. K N Muthreja, Applied Hydrology, Tata Mc-GrawHill.
3. K Subramanya, Water Resources Engineering through Objective Questions, TataMc -
    a. GrawHill.

CEP505	EARTHQUAKE ENGINEERING	PE – I	2-1-0	3 Credits

Pre-requisites: NA

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Elements of Seismology ,Definitions of Magnitude, Intensity, Epicenter, etc. General features of tectonic of seismic regions, Seismographs. Theory of Vibrations	8
2.	Free vibrations of single degree, two degree and multiple degree freedom systems. Computation of dynamic response to time dependent forces. Vibration isolation. Vibration absorbers.	8
3.	Principles of Earthquake Resistant Design ,Response spectrum theory. Brief introduction to accelerographs and S.R.R.'s.	8
4.	Nature of dynamic loading resulting from earthquakes. Application of Response spectrum. Theory to a seismic design to structures. Resistance of structural elements and structures for dynamic loads, design criteria-strength and deflection. Ductility and absorption of energy.	8
5.	Dynamic Properties of Soils, Remedial measures and management of earthquake disaster , Introduction to Indian Standard Codes IS : 1893 – 1984 and IS: 4326 – 1993	8

CEP506	ENVIRONMENTAL GEO-TECHNOLOGY	PE – I	2-1-0	3 Credits

Pre-requisites:None

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	A consideration of technical and scientific aspects of key geo - societal issues.	8
2.	Case studies and analysis of current and historic databases will be used to illustrate topics including impact of climate change, energy resources, water and soil pollution, and health risks posed by heavy metals and emerging pollutants.	16

3.	Influence of disposal of industrial and construction waste on the Geo-environment	**12**
4.	Effect and impact of effluent from chemical and mining industries on ground water, Design of clay liners	**8**

Reference Books

1. Introduction to Environmental Geotechnology by Hsai – YangFang
2. CDEEP, IITB video lectures on course CE 488 and CE 641 by Prof. D. N.Singh

CEP507	**ADVANCE SURVEYING**	**PE – I**	**2-1-0**	**3 Credits**

Pre-requisites: Surveying &Geomatics

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	**Field Astronomy**: Introduction, purposes, astronomical terms, Astronomical coordinate system, astronomical triangle, determination of azimuth, declination & hour angle, different types of time, LMT, ST & GMT and interdependencies. Equation of time,	**12**
2.	**Aerial photogrammetry**: Introduction, Principle, Uses, Aerial & terrestrial photographs, Scale of vertical and tilted photograph, photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics,map substitutes.	**10**
3.	**Remote Sensing And Geographical Information System**: Introduction, Electromagnetic spectrum, Principles of energy interaction in atmosphere and earth surface, Image interpretation techniques, digital satellite data; Global Positioning system: Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, spatial information system, Geos patial analysis, Integration of Remote sensing & GIS and Applications in Civil Engineering	**12**
4.	**Hydrographic surveying**: Introduction, shoreline survey, sounding method of locating sounding, Three pointproblem.	**10**

Reading:

1. Surveying Vol. II and III by Dr. B.C. Punamia, Laxmi Publishers. NewDelhi
2. Surveying Vol. II and III by Dr. K.R. Arora, Standard Book House. NewDelhi
3. Advanced Surveying by R. Agor, Khanna Publishers, NewDelhi

4. Remote Sensing and GIS by B Bhatia, Oxford University Press, NewDelhi.
5. Remote sensing and Image interpretation by T.M Lillesand,. R.W Kiefer,. and J.W Chipman, 5th edition, John Wiley and SonsIndia

CEP508	WATER RESOURCE SYSTEM	PE – I	2-1-0	3 Credits

Pre-requisites: Fluid Mechanics & Hydrology

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	**Introduction and Basic Concepts**: Introduction, System Components, Planning and management, Concept of a system, Advantages and limitations of systems approach, Modeling of Water Resources Systems, Simulation andoptimization, Economics in water resources, Challenges in water sector	6
2.	**Linear Programming and Applications**: General form of LP, Standard and Canonical forms of LP, Elementary transformations, Graphical method, Feasible and infeasible solutions, Simplex method, Dual and sensitivity analysis, LP problem formulation, Reservoir sizing and Reservoir operation using LP	8
3.	**Simulation:** Introduction, River basin simulation, Reservoir operation simulation, Performance evaluation - Reliability, Resiliency and Vulnerability, Some simulation models	4
4.	**Water Resources Systems Modeling:** River basin planning and management, Water distribution systems, Groundwater systems, Water quality modeling, Floodplain management, Urban storm water management	8

Reading:

1. Loucks D.P, Stedinger J.R and Haith D.A, 'Water Resources Systems Planning and Analysis', Prentice Hall, USA, 1981.

CEP509	INDUSTRIAL STRUCTURES	PE – I	2-1-0	3 Credits

Pre-requisites: Steel Structure

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Industrial steel building frames: Types of frames, bracing, crane girders and columns, workshop sheds, trussed bents	**6**
2.	Transmission and Communication towers: Types and configuration, Analysis and design; Chimneys; Loads and stresses in chimney shaft, Earthquake and wind effect, Stresses due to temperature difference, combined effect of loads and Temperature	**10**
3.	Silos and Bunkers; Jassen's theory, Airy's theory, Shallow and deep bins, Rectangular bunkers with slopping bottom, Rectangular bunkers with high side walls, Steel stacks; introduction, force acting on a steel stack, design consideration, design example of stacks	**12**
4	Concrete Shell Structures: Folded plate and cylindrical shell structures; Introduction, structural behaviour of long and short shells, beam and arch action, analysis and design of cylindrical shell structures	**10**
5.	Machine foundations; introduction, machine vibration, structural design of foundation to rotary machines, impact machines, vibration characteristics, design consideration of foundation to impact machine, grillage, pile and raft foundation.	**10**

Reading:

1. 1.Design of Steel Structures, Arya and Azmani, Nem Chand Brothers, Roorkee,2004
2. Punmia B.C, Ashok Kr. Jain, Arun Kr. Jain, RCC Designs (Reinforced Concrete Design), 10th Edition, Lakshmi Publishers,2006.
3. Ramachandra, Design of Steel Structures, 12th Edition, Standard Publishers,2009.

CEP510	DESIGN OF STRUCTURAL SYSTEMS	PE – I	2-1-0	3 Credits

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Classification of structural systems, Loads, assumptions and Idealizations	10
2.	The whole structural design process including definition of functional requirements, selection of structural scheme	18
3.	Formulation of design criteria, preliminary and computer - aided proportioning, and analysis of response, cost, and value.	18

Reading:

1. Structural Stability - Theory and Implementation by W.F.Chen and E.M.Lui byElsevier.
2. Reeve,D., Chadwick, A. and Fleming, C. Coastal Engineering -Processes, theory and design practice, Spon Press, Taylor & Francis Group, London &Paris,2004.

OPEN ELLECTIVE – I

CEO511	**ENVIRONMENT IMPACT ASSESSMENT**	**OE – I**	**2-1-0**	**3 Credits**

Prerequisites: Environmental Engineering

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Evolution of EIA: Concepts ofEIA methodologies, Screening and scoping;	**8**
2.	Rapid EIA and Comprehensive EIA; GeneralFramework for Environmental Impact Assessment, Characterization and site assessment.Environmental Risk Analysis	**8**
3.	Definition of Risk, Matrix Method. Checklist method, Faulttree analysis, Consequence Analysis; Socioeconomic aspects, measures of effectiveness of pollution control activities	**12**
4	Environmental Legislation; Introduction to EnvironmentalManagement Systems; Environmental Statement - procedures; Environmental Audit: CostBenefit Analysis; Life Cycle Assessment; Resource Balance, Energy Balance &ManagementReview; Operational Control;	**14**
5	Case Studies on EIA.	**2**

CEO512	RELIABILITY ENGINEERING	OE – I	2-1-0	3 Credits

Pre-requisites: NA

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Introduction: Definitions and concepts, Reliability , Probability, Impossible and certain events. Failure-data and its Analysis, Hazard rate and Failure density, Reliability in terms of hazard rate, Failure density in other situations.	10
2.	Hazard Models : Type of distribution and standard deviation and variance, Expectations , Conditional probabilities.	8
3.	System Reliability : Series, Parallel and mixed configurations. Methods of solving Complex systems.	8
4.	Reliability improvement : Types of redundancies, Reliability allocation for a series of system, Optimization Reliability - cost trade-off.	8

CEO513	GLOBAL POSITIONING SYSTEM	OE – I	2-1-0	3 Credits

Pre-requisites: NA

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Overview of GPS – Development of Global Surveying Techniques, History of GPS, New Satellite Navigations constellations, Basic concept of GPS, Space, Control and User segments.	8
2.	GPS Observables – Structure of GPS Signal, Frequency, P Code, C/A code and data format, Generation of C/A code, Navigation data bits Pseudo range measurements, Phase measurements, system accuracy characteristics, DOP, Data format.	8
3.	Surveying with GPS–Planning a GPS Survey, Positioning methods – point positioning, relative positioning, Static, Fast static, RTK, Differential Positioning, Post processing, real-time processing,	8
4	Accuracy measures, software modules, Network adjustments, Dilution of Precision.	8
5	Applications of GPS – General Uses of GPS, Attitude determination, Interoperability of GPS. Future of GPS – Modernization plans of navigational satellites, Hardware and software improvements.	8

Reading:

1. Bradford W. Parkinson, James Spilker, Global Positioning System: Theory and Applications, Vol. I, 1996.
2. Gunter Seeber, Satellite Geodesy Foundations, Methods and Applications, Walter de Gruyter Pub., 2003.
3. Hofmann W.B, Lichtenegger, H, Collins, J Global Positioning System – Theory and Practice, Springer-VerlagWein, 2001.

CEO514	DISASTER MANAGEMENT	OE – I	2-1-0	3 Credits

Pre-requisites: NA

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Understanding Disaster:Concept of Disaster – Different approaches- Concept of Risk – Levels of Disasters – Disaster Phenomena and Events (Global, national and regional) Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards – Characteristics and damage potential or natural hazards; hazard assessment – Dimensions of vulnerability factors; vulnerability assessment – Vulnerability and disaster risk – Vulnerabilities to flood and earthquake hazards	8
2.	Disaster Management Mechanism:Concepts of risk management and crisis managements – Disaster Management Cycle – Response and Recovery – Development, Prevention, Mitigation and Preparedness – Planning for Relief	8
3.	Capacity Building:Capacity Building: Concept – Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk – Counter-Disaster Resources and their utility in Disaster Management – Legislative Support at the state and national levels	8
4	Coping with Disaster:Coping Strategies; alternative adjustment processes – Changing Concepts of disaster management – Industrial Safety Plan; Safety norms and survival kits Mass media and disaster management	8
5	Planning for disaster management:Strategies for disaster management planning – Steps for formulating a disaster risk reduction plan – Disaster management Act and Policy in India – Organizational structure for disaster management in India – Preparation of state and district disaster management plans	8

TEXT BOOKS:

Manual on Disaster Management, National Disaster Management, Agency Govt of India.
Disaster Management by MrinaliniPandey Wiley 2014.
Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

CEO515	**ENVIRONMENTAL MANAGEMENT SYSTEM**	**OE – I**	**2-1-0**	**3 Credits**

Pre-requisites: NA

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Environmental Management System in Industry : Quality of environment. ISO 14000 Environment standards, EMS model. Policy planning process, implementation and operation in industry.	8
2.	Environmental Pollution & Control Techniques: Definition of pollution, pollutant and significance of pollution of pollution control. Types of environment pollution: air, water and land pollution and control.	8
3.	Hazardous waste management system : landfill as incineration, environment problems and solution Concept of Restoration Ecology and Reclamation of degraded land.	8
4	Environment Impact Assessment and Audits : Basic concept of EIA, Needs for EIA and Methods. Introduction and Significance of Environment Audit. Audit regulations, standards and protocols. Setting up EIA and Audit Division in Industry.	8
5	Disasters and their management: Introduction of disasters, Classification and sub types of disasters. Industrial disasters and related case studies. Precautions of SHE in disaster management. Role of SHE in disaster management	8

CEO516	**ADVANCE ENGINEERING SYSTEMS**	**OE – I**	**2-1-0**	**3 Credits**

Pre-requisites: NA

Detailed Syllabus:

MODULE	CONTENTS	Hrs
1.	Equations of motion for simple physical system. mechanical, electrical and eectromechanical systems	10
2.	Equations of motion for simple heat, conduction and fluid system. Analogies. Equations of motion for mechanical system in two and three dimension. Dynamic response of first orderand second order systems	12
3.	Forced oscillations of elementary systems. Dynamic stability of compound system. Total response of compound system. Fundamentals of compound systemanalysis.	12

*** Human Resource Development and Organizational Behavior (syllabus prepared and taught by Training and placement Cell, BIT, Sindri)**

*** Cyber Law and Ethics (syllabus prepared and taught by CSE & IT Department)**

CE501P Steel design lab

List of Experiments

1. Design and Drawing the different types of riveted joints and Bolted joints.
2. Design and Drawing the different types of welded joints.
3. Design and Drawing the tension members.
4. Design and Drawing the compression members.
5. Design and Drawing the Eccentric connection of Bolted joints.
6. Design and Drawing the Eccentric connection of Welded Joints.
7. Design and Drawing the Plate Girder.
8. Design and Drawing the Grillage footing.
9. Design and Drawing the slab base and Gusset Base.
10. Design and Drawing the Beams.

- **LIST OF EXPERIMENTS**

Geotechnical Engineering I

Experiment 1: Determination of Water content of asoil sample

Experiment 2: Determination of Specific gravity ofsoil solids

Experiment 3: To determine the in-situ density of soil using "Sand Replacement Method"

Experiment 4: To determine the in-situ density ofsoil using "Core-Cutter Technique"

Experiment5: Toobtainthegradationcurveofcoarse-grainedsoilusingSieveanalysis (dry and wet)

Experiment 6: To obtain the gradation curve of fine-grained soils using hydrometer analysis.

Experiment 7: Determination of co-efficient of permeability of a soil sample using constant and falling head test apparatus.

Experiment 8:Determination of Plastic and Liquidlimit of a soil sample

Experiment 9:Determination of Shrinkage limit ofa soil sample

Experiment10: Determinationofmaximumdrydensityandoptimummoisturecontent of a soil sample using IS light compaction test

Experiment11: To obtain the shear strength parameters of a soilsample usingDirect Shear Test apparatus.

CE503P Environmental Engineering Laboratory

Name of the Experiment

1. To determine the alkalinity of a given water sample
2. To determine the acidity of a given water sample
3. To determine the pH value of the given samples of Water
4. To determine the hardness of the given water samples
5. To determine the chloride content of a given water sample
6. To determine the residual chlorine of given water sample
7. To determine the total solids of a given sample of water
8. To determine the turbidity of the given water sample
9. To determine the color of the given water sample
10. To determine the odor of the given water sample

Field Survey

Sl. No.	List of Experiments
1.	Study of theodolite in detail - practice for measurement of horizontal and vertical angles.
2.	Triangulation survey of a given area by theodolite
3.	Trigonometric Leveling - elevation and distance measurements when base accessible
4.	Trigonometric Leveling - elevation and distance measurements when base inaccessible
5.	Heights and distance using principles of tacheometric surveying
6.	Setting out a transition curve
7.	Draw contour map of a given area
8.	Determination of area using Total station
9.	Measurement of horizontal and vertical angle using Total station
10.	Determination of remote height using Total station