E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

NAGAPATTINAM – 611002

(Affiliated to Anna University, Chennai | Accredited by NAAC with 'A++' Grade|Accredited by NBA T1(B.E. – CSE, CIVIL, ECE, EEE, MECH& B.Tech – IT) |Approved by AICTE, New Delhi)

B.E CIVIL ENGINEERING R- 2023

THIRD YEAR

CURRICULUM AND SYLLABUS FOR FIFTH SEMESTER

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	MAX.MARKS		
							CA	ES	TOTAL
Theory Courses									
2302CE501	Structural Analysis I	PCC	3	0	0	3	40	60	100
2302CE502	Design of RC Structures	PCC	3	0	0	3	40	60	100
2302CE503	Geotechnical Engineering II	PCC	3	0	0	3	40	60	100
	Elective I	PEC	3	0	0	3	40	60	100
	Elective II	PEC	3	0	0	3	40	60	100
	Open Elective I	OEC	3	0	0	3	40	60	100
Laboratory Courses									
2302CE551	Geotechnical Engineering Laboratory	PCC	0	0	2	1	60	40	100
2302CE552	CADD Laboratory (Design and detailing)	PCC	0	0	2	1	60	40	100
2302CE553	Survey Camp	PCC	0	0	0	1	60	40	100
2304GE551	Professional Development course - III	EEC	0	0	2	1	100	0	100
2301LS501	Life Skills - V	EEC	0	0	0	0	100	0	100
TOTAL			**18**	**0**	**6**	**22**	**620**	**480**	**1100**

2302CE501 STRUCTURAL ANALYSIS I

L	T	P	C
3	0	0	3

PREREQUISITE:

1. Mechanics of solids I.
2. Mechanics of solids II.

COURSE OBJECTIVES:

1. To understand the concept of analysis of indeterminate structures.
2. To Understand the methods of analysis of indeterminate trusses for external loads, lack of fit and thermal effects and also the influence line concept for indeterminate structure.
3. To study behavior of arches, Settlement and temperature effects.

COURSE OUTCOMES:

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

CO1: Calculate the forces in the members of pin jointed frames using Energy and consistent Deformation Method.
CO2: Calculate bending moment and shear force diagrams for continuous beams and frames by slope deflection method.
CO3: Determine bending moment and shear force diagrams for continuous beams and frames by moment distribution method.
CO4: Determine absolute maximum bending moment and shear force in beams due to moving loads.
CO5: Determine the maximum moment, shear and stresses produced in arches due to external loads, and temperature effects.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO2	3	2	1	-	3	-	-	2	-	-	-	2	-	-	-
CO3	3	2	1	-	3	-	-	2	-	-	-	2	-	-	-
CO4	2	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO5	2	1	-	-	-	-	-	1	-	-	-	-	-	-	-

COURSE CONTENTS:

MODULE I INDETERMINATE FRAMES **9 Hours**

Degree of static and kinematic indeterminacies for plane frames – analysis of indeterminate pin-jointed frames – rigid jointed frames (Degree of statical indeterminacy up to two) – Energy and consistent deformation methods.

MODULE II SLOPE DEFLECTION METHOD **9 Hours**

Analysis of continuous beams - sinking of supports – rigid frames (with and without sway).

MODULE III MOMENT DISTRIBUTION METHOD **9 Hours**

Distribution and carryover of moments – Stiffness and carry over factors - Analysis of continuous beams - sinking of supports – Rigid frames (with and without sway).

MODULE IV MOVING LOADS AND INFLUENCE LINES **9 Hours**

Influence lines for reactions in statically determinate structures – influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections –Calculation of critical stress resultants due to concentrated and distributed moving loads. Muller Breslau's principle – Influence lines for continuous beams and single storey rigid frames.

MODULE V ARCHES **9 Hours**

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

TOTAL: 45 HOURS

REFERENCES:

1.Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Laxmi Publications Pvt. Ltd, New Delhi, 2017.

2.Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 2017.

3.L.S. Negi& R.S. Jangid, "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 6th Edition, 2003.

4. Reddy. C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi,2013

5. BhavaiKatti, S.S, "Structural Analysis – Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., New Delhi, 2021.

6. Wang C.K., "Indeterminate Structural Analysis", Tata McGraw Hill Education Pvt. Ltd.,New Delhi, 2021.

7. DevadasMenon, "Structural Analysis", Narosa Publishing House, 2010.

8. Ghali.A., Nebille and Brown. T.G., "Structural Analysis - A unified classical and matrix approach" Sixth Edition, SPON press, New York, 2017.

9. Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis"., PHI Learning Pvt.Ltd., New Delhi, 2013.

2302CE502 DESIGNOFRCSTRUCTURES L T P C
3 0 0 3

PREREQUISITE:

1. Mechanics of solids I
2. Concrete Technology

COURSE OBJECTIVES:

1.To develop an understanding on the basic concepts in the behavior and design of Reinforced concrete systems and elements using working stress method.
2. To introduce the basic concepts and steps in the design of beams and slabs mainly in accordance with Limit state method.
3. To underline the design principles of RC members for shear, bond, and torsion.
4. To introduce the concepts in the design of RC Column design.
5. To give the knowledge in the concept of RC footings.

COURSE OUTCOMES:

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

CO1: Describe various design methods and their fundamental principles.
CO2: Use the limit state method to design flexural members for different loadings and supports.
CO3: Solve design problems of flexural members with various cross-sections subjected to shear, bond, and torsion.
CO4: Calculate design parameters for RC columns under varying end conditions and cross-sectional geometries.
CO5: Apply design principles to select and design RC footings suitable for varied site conditions and geometries.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	-	2	-	1	-	-	-	1	-	3	-	-
CO3	3	3	3	-	2	-	1	-	-	-	1	-	3	-	-
CO4	3	3	3	-	2	-	1	-	-	-	1	-	3	-	-
CO5	3	3	3	-	2	-	1	-	-	-	1	-	3	-	-

COURSE CONTENTS:

MODULE I METHODSOFDESIGN **9 Hours**

Ultimate load method- Working stress method-Limit state method-Characteristic strength-Characteristic load-Design values-Partial safety factors - Codal provisions - Practical aspects of design-Design of flexural members by working stress method.

MODULE II LIMITSTATEDESIGNFOR FLEXURE **9 Hours**

Analysis and design of one – way and two-way slabs – Singly and doubly reinforced rectangular beams-Cantilever beams – Standard method of detailing of RC beam sand slabs.

MODULE III LIMIT STATE DESIGNFOR BOND,ANCHORAGE, SHEAR,AND **9 Hours**

TORSION

Behavior of RC members in bond and anchorage – Curtailment of reinforcement-Design requirements as per code provision – Behavior of RC beams in shear and torsion –Design of RC members for combined bending, shear, and torsion.

MODULE IV LIMITSTATEDESIGNOF COLUMNS **9 Hours**

Columns–Assumptions–Effective length–Classification–Design guidelines–Axially loaded short columns with lateral ties and helical reinforcement – Columns subjected to uni-axial bending and biaxial bending – Standard method of detailing of RC columns.

MODULE V LIMITSTATEDESIGNOF FOOTING **9 Hours**

Introduction and selection of footing under different site conditions – Design of wall footing –Design of axially and eccentrically loaded rectangular footing – Combined footing - Standard method of detailing of RC footing.

TOTAL: 45 HOURS

REFERENCES:

1.B.CPunmia,Ashok.KumarJain,ArunKumarJain"LimitStateDesignofReinforcedConcrete",Laxmi Publications (P) Ltd, NewDelhi 2007.

2.UnnikrishnaPillai,S.,DevdasMenon,"ReinforcedConcreteDesign",TataMcGraw-HillPublishingCompanyLtd., NewDelhi2003.

3.Sinha,S.N.,"ReinforcedConcreteDesign",TataMcGraw-HillPublishingCompanyLtd.,NewDelhi2002.

4.Varghese,P.C.,"LimitStateDesignofReinforcedConcrete",PrenticeHallofIndia,Pvt.Ltd.,NewDelhi2002

5.KrishnaRaju,N.,"DesignofReinforcedConcreteStructures",CBSPublishers&Distributors,NewDelhi,2003.

6. IS 456-2000 "Plain and Reinforced Concrete Code of Practice"

2302CE503 GEOTECHNICAL ENGINEERING II

L	T	P	C
3	0	0	3

PREREQUISITE:

1. Geo technical Engineering I.
2. Engineering Geology.

COURSE OBJECTIVES:

1. To impart ability to assess the soil condition at a given location.
2. To design various types of foundations.
3. To develop an understanding of the stability of the foundation structures.

COURSE OUTCOMES:

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

CO1: Illustrate the suitable techniques used for sub soil exploration.
CO2: Calculate the bearing capacity of soil for the given parameters.
CO3: Select the dimensions of the foundation for various types of footing.
CO4: Interpret the load carrying capacity of piles.
CO5: Explain the Earth pressure analysis on retaining walls.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	2	-	-	-	-	-	2	2	-
CO2	3	3	1	-	-	2	2	-	-	-	-	-	2	2	-
CO3	3	3	1	-	-	2	2	-	-	-	-	-	2	2	-
CO4	3	3	1	-	-	2	2	-	-	-	-	-	2	2	-
CO5	3	3	1	-	-	2	2	-	-	-	-	-	2	2	-

COURSE CONTENTS:

MODULE I SOIL EXPLORATION AND SITE INVESTIGATION **9 Hours**

Introduction – Planning and stages in sub-surface exploration – depth and spacing of exploration – Methods of exploration – Test pit – Trenches – Geophysical methods: Seismic refraction and Electrical resistivity method –Boring : Auger boring, Shell and Auger, Wash boring and Rotary drilling – Types of soil sample: disturbed and undisturbed soil samples – Features of sampler affecting soil disturbance – standard penetration test – static and dynamic cone penetration test – bore log report.

MODULE II BEARING CAPACITY OF SHALLOW FOUNDATIONS **9 Hours**

Introduction – Bearing capacity- definition – types of shear failure – Bearing capacity of shallow foundation on homogeneous deposits - Methods: Terzaghi's ,Skempton's and BIS methods – Effect of water table on bearing capacity – Bearing capacity from in-situ tests - SPT, SCPT and plate load test methods - improving bearing capacity of soil.

MODULE III FOOTING, RAFT AND SETTLEMENT OF FOUNDATIONS **9 Hours**

Types of foundation – contact pressure distribution below isolated footing – types and proportioning of combined footing – types and application of mat foundation – floating foundation – Settlement: total and differential settlements – causes and methods of minimizing settlement.

MODULE IV DEEP FOUNDATION **9 Hours**

capacity of single pile in cohesionless and cohesive soil – static formula – dynamic formulae (Engineering News and Hileys) – Capacity from in-situ tests (SPT and SCPT) – Negative skin friction – Carrying capacity of Pile group – Pile load test – Under-reamed piles – Introduction to well foundation and Diaphragm wall.

MODULE V EARTH PRESSURE AND STABILITY OF SLOPES **9 Hours**

Earth pressure in soils: active and passive states – Lateral earth pressure Rankine's theory – stratified soil – Cullman's Graphical method –Slopes – Infinite and finite slopes – types of failure – causes of failure – Procedure for slip circle method and method of slices.

TOTAL: 45 HOURS

REFERENCES:

1. Arora .K.R, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2011.

2. Punmia .B.C, "Soil Mechanics and Foundations Engineering", Laxmi Publications Pvt.Ltd. New Delhi, 2005.

3. Murthy .V.N.S, "Textbook of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 2009.

4. Bowles .J.E, "Foundation analysis and design", McGraw Hill, 2001.10th Edition.

5.Das .B.M, "Principles of Foundation Engineering" (Fifth edition), Thomson Books, 2010

Online reference/website

1. https://onlinecourses.nptel.ac.in/noc21_ce39

2302CE001 PREFABRICATED STRUCTURES L T P C
3 0 0 3

PREREQUISITE:

1. Construction Materials and Technology.
2. Concrete Technology

COURSE OBJECTIVES:

1. To introduce the basic concepts of prefabrication.
2. To acquire the knowledge of prefabrication components and systems.
3. To understand the design principles in prefabrication.
4. To perceive the types of joints and connections in structural members.
5. To impart knowledge about the structural stability.

COURSE OUTCOMES:

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

CO1: Understand concepts about principles of prefabrication, production, transportation and erection.
CO2: Acquire knowledge about panel systems, slabs, beams, shear walls and columns used in precast construction.
CO3: Acquire knowledge about design of cross section, joint flexibility.
CO4: Acquire knowledge about joints and connection in precast construction.
CO5: Acquire knowledge about structural stability.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	-	1	1	1	-	-	2	2	2	-
CO2	3	3	3	3	1	1	1	1	1	-	-	2	2	-	-
CO3	3	3	3	3	1	1	1	1	1	-	2	2	2	-	-
CO4	3	3	3	2	1	1	1	1	1	-	1	2	2	-	-
CO5	3	3	3	2	1	1	1	1	1	-	1	2	2	-	-

COURSE CONTENTS:

MODULE I INTRODUCTION **9 Hours**

Need for prefabrication -Advantages and limitations – Principles of prefabrication – Modular coordination – Standardization– Loads and load combinations– Materials – Production – Transportation – Erection.

MODULE II PREFABRICATED COMPONENTS AND SYSTEMS **9 Hours**

Behaviour and types of structural components– roof and floor slabs – Walls panels - Shear walls - Beams - Columns – skeletal system- portal frame system-Large panel systems- block system.

MODULE III DESIGN PRINCIPLES **9 Hours**

Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems- Design for stripping, stacking, transportation and erection of elements.

MODULE IV JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS **9 Hours**

Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction joints, contraction joints, expansion joints. Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

MODULE V DESIGN FOR ABNORMAL LOADS **9 Hours**

Progressive collapse – Fire Resistance – Renovation, Demounting and Demolition -Codal provisions - IS15916:2010, ASCE7-02,ACI318-02– Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse -case study.

TOTAL: 45 HOURS

REFERENCES:

1. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers, USA,1991.

2. Lewitt,M. " Precast Concrete- Materials, Manufacture, Properties And Usage ,CRC Press, 2019.

3. Alfred Steinle, Hubert Bachmann, Mathias Tillmann, Philip Thrift. "Precast Concrete Structures", Ernst & Sohn, Berlin, 2019.

4."Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.

5." Precast concrete connection details", Structural Design manual, Society for the studies in the use of precast Concrete, Netherland BetorVerlag, 2009.

2302CE006 SOLID AND HAZARDOUS WASTE MANAGEMENT

L	T	P	C
3	0	0	3

PREREQUISITE:

1.Basic Sciences - Environmental Science/Studies, Chemistry
2.Engineering Mathematics/Calculus
3.Environmental Engineering Fundamentals / Civil Engineering Basics

COURSE OBJECTIVES:

1.To provide a foundational understanding of municipal solid waste management principles and the associated regulatory landscape.
2.To explore the characterization, health effects, and fundamental management and disposal options for hazardous and radioactive waste.
3. To present chemical and physicochemical treatment processes for solid and hazardous waste including groundwater contamination and remediation.
4.To introduce the principles and applications of diverse biological processes for the treatment and in-situ remediation of solid and toxic waste.
5. To cover the concepts of landfill design for solid and hazardous waste and methodologies for defining and assessing environmental risks.

COURSE OUTCOMES:

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

CO1: Develop plans for municipal solid waste management in compliance with relevant regulations.
CO2: Plan appropriate management and disposal strategies for hazardous and radioactive waste, considering their characterization, health effects, and relevant regulations.
CO3: Select appropriate chemical and physicochemical treatment processes for municipal solid waste and hazardous wastes and propose remediation strategies for groundwater contamination.
CO4: Utilize various biological processes for the treatment and remediation of solid and toxic wastes.
CO5: Solve problems related to solid and hazardous waste disposal through appropriate landfill design, incineration, and environmental risk assessment methods.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	3	1	-	-	2	-	-	-	2	-
CO2	3	3	3	1	-	3	1	-	-	2	-	-	-	2	-
CO3	3	3	3	1	-	3	1	-	-	1	2	-	-	3	-
CO4	3	1	2	-	-	3	-	-	-	-	1	-	-	3	-
CO5	3	3	3	1	-	3	1	-	-	1	1	-	-	3	-

COURSE CONTENTS:

MODULE I REGULATIONS AND MUNICIPAL SOLID WASTE MANAGEMENT – FUNDAMENTALS **9 Hours**

Relevant Regulations: Municipal solid waste (management and handling) rules; hazardous waste (management and handling) rules; biomedical waste handling rules; fly ash rules; recycled plastics usage rules; batteries (management and handling) rules.

Municipal Solid Waste: Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options.

MODULE II **HAZARDOUS AND RADIOACTIVE WASTE MANAGEMENT – FUNDAMENTALS** **9 Hours**

Hazardous Waste: Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects.

Radioactive Waste: Fundamentals Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options.

MODULE III **PHYSICOCHEMICAL TREATMENT OF SOLID AND HAZARDOUSWASTE** **9 Hours**

Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapour extraction, air stripping, chemical oxidation); ground water contamination and remediation.

MODULE IV **BIOLOGICAL TREATMENT OF SOLID AND HAZARDOUS WASTE** **9 Hours**

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

MODULE V **LANDFILL DESIGN AND ENVIRONMENTAL RISK ASSESSMENT** **9 Hours**

Landfill design for solid and hazardous waste; leachate collection and removal; landfill covers; incineration Defining risk and environmental risk; methods of risk assessment; case studies.

TOTAL: 45 HOURS

REFERENCES:

1. *Basics of Solid and Hazardous Waste Mgmt. Tech. by KantiL.Shah 1999, Prentice Hall.*
2. *Solid And Hazardous Waste Management 2007 by S.C.Bhatia Atlantic Publishers &Dist*
3. *John Pichtel Waste Management Practices CRC Press, Taylor and Francis Group 2005.*
4. *LaGrega, M.D.Buckingham,P.L. and Evans, J.C. Hazardous Waste Management, McGraw Hill International Editions, New York, 1994.*
5. *Richard J. Watts, Hazardous Wastes - Sources, Pathways, Receptors John Wiley and Sons, New York, 1997.*

2302CE032 GLOBAL WARMING AND CLIMATE CHANGE

L	T	P	C
3	0	0	3

PREREQUISITE:

NIL

COURSE OBJECTIVES:

1. To understand the Earth's climate system and the concept of global warming.
2. To analyse the global warming and their effects due to climate change.
3. To comprehend the impact of climate change on society and its mitigation measures.

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1: Outline the principle involved in the greenhouse gas emission.
CO2: Describe the climate components and the circulation system.
CO3: Illustrate about the climate variability parameters.
CO4: Discuss about the physical processes involved in the climate system.
CO5: Explain the carbon emission and its mitigation methods.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO2	2	-	3	2	-	2	-	-	-	-	-	-	-	-	-
CO3	2	-	3	3	-	-	-	-	-	-	3	-	-	-	-
CO4	2	-	3	3	3	2	-	-	-	-	-	-	-	-	-
CO5	2	-	3	3	3	1	2	-	2	2	2	-	2	2	-

COURSE CONTENTS:

MODULE I INTRODUCTION OF GLOBAL WARMING **9 Hours**

Introduction - the gas law - ideal gas equation- the mole concept- sample calculations- ppm - Sulphur pollutants-oxides of nitrogen - particulate - Green House Gases.

MODULE II BASICS OF GLOBAL CLIMATE **9 Hours**

Components and phenomena in the climate system - basics of radioactive forcing - atmospheric circulation-ocean circulation-land surface processes - the carbon cycle.

MODULE III OVERVIEW OF CLIMATE VARIABILITY AND CLIMATE SCIENCE **9 Hours**

Climate dynamics, climate change and climate prediction - the chemical and physical climate system and aspects - El Nino and global warming - global change in recent history.

MODULE IV PHYSICAL PROCESSES IN THE CLIMATE SYSTEM **9 Hours**

Conservation of momentum-equation of state- temperature equation - continuity equation -conservation of mass applied to moisture – saturation - wave processes in the atmosphere and ocean.

MODULE V MITIGATION MEASURE, EMISSION TARGETS AND CARBON TREADE **9 Hours**

Introduction-reduction of carbon dioxide emissions from power generation- carbon credits-carbon dioxide from vehicle - miscellaneous source of carbon dioxide- uptake of carbon dioxide by vegetation

TOTAL: 45 HOURS

REFERENCES:

1.Atmospheric Pollution- 1st edition-2014 Dr. Clifford Jones & ISBN 978-87-7681-416-8.
2.The science of global warming and our energy future – Edmond A. Mathez& Jason E. Serdon – 2nd Edition- Columbia University Press –New York.
3. Climate Change-JOSEPH ROMM- 2nd Edition –oxford university press.
4. William Nordhaus, The Climate Casino: Risk, Uncertainty, and Economics for a Warming World (Yale, 2013; ISBN 978-0-300-21264-8).
5. Roger A. Pielke, Jr., The Climate Fix (Basic Books, 2010; ISBN 978-0-465-02519-0).
6. Hadley Wickham and Garrett Grolemund, R for Data Science (O'Reilly, 2017; ISBN 978- 1-491-91039-9).

2302CE551 GEOTECHNICAL ENGINEERING LABORATORY

L	T	P	C
0	0	2	1

PREREQUISITE:

1. Mechanics of Fluids.
2. Geotechnical Engineering I.

COURSE OBJECTIVES:

1. To provide exposure to the students with hands on experience about classification of the soil.
2. To grant knowledge about field density of the soil.
3. To impart the knowledge about basic bearing capacity of the soil.
4. To attains adequate knowledge in assessing both Physical and Engineering behavior of soils through laboratory testing procedures.

COURSE OUTCOMES:

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

CO1: Examine the grain size distribution of soil.
CO2: Determine the specific gravity and Atterberg limits of soil.
CO3: Estimate the field density of soil by core cutter and sand replacement methods.
CO4: Determine compaction and shear strength parameters of soil.
CO5: Obtain the compressibility, permeability parameters of soil.
CO6: Examine the grain size distribution of soil.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	-	2	-	-	2	-	3	-	-
CO2	3	2	1	1	1	2	-	2	-	-	2	-	3	-	-
CO3	3	2	1	1	1	2	-	2	-	-	3	-	3	-	-
CO4	3	2	1	1	1	2	-	2	-	-	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-

LIST OF EXPERIMENTS:

1. Determination Of Specific Gravity of Soil
2. Determination of Grain Size Distribution by Sieve Analysis
3. Determination of grain size by Hydrometer
4. Determination of Liquid limit, Plastic Limit and Shrinkage Limit of the soil
5. Determination of OMC and Dry density by Standard Proctor Compaction test
6. Determination of Field density by Core cutter and Sand Replacement method
7. Determination of Permeability Coefficient using Constant head method
8. Determination of Permeability Coefficient using Variable head method
9. Determination of shear strength by using Direct Shear test
10. Determination of compression strength by using Unconfined compressive strength test

TOTAL: 30 HOURS

DEMO EXPERIMENTS:

1. Consolidation Test
2. Triaxial Shear Test

REFERENCES:

1.Soil Mechanics Lab Manual – BALASUBRAMANI V.
2.Saibaba Reddy, E. Ramasastri, K. "Measurement of Engineering Properties of Soils", New age International (P) Limited Publishers, New Delhi, 2002.
3. Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1990.

2302CE552 CADD LABORATORY (DESIGN AND DETAILING

L	T	P	C
0	0	2	1

PREREQUISITE:

1. CADD Laboratory

COURSE OBJECTIVES:

1. To learn the software developing skills for structural design.
2. To impart knowledge and skill relevant to building and structural detailed drawing and analyse the building elements using computer software.

COURSE OUTCOMES:

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

CO1: Learn the software developing skills for structural design.
CO2: Draw and analyzing the structural detailing of beam, column by using computer software.
CO3: Draw and analyzing the structural detailing of slab, footing by using computer software.
CO4: Draw and analyzing the structural detailing of water tank by using computer software.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	-	2	-	-	2	-	3	-	-
CO2	3	2	1	1	1	2	-	2	-	-	2	-	3	-	-
CO3	3	2	1	1	1	2	-	2	-	-	3	-	3	-	-
CO4	3	2	1	1	1	2	-	2	-	-	3	-	3	-	-

LIST OF EXPERIMENTS:

1. Introduction to Design and Detailing of Building Elements
2. Design of Singly Reinforced Beam.
3. Design of Doubly Reinforced Beam.
4. Design of One-Way Slab.
5. Design of Two-Way Slab.
6. Design of Circular Column.
7. Design of Rectangular Column.
8. Design of Rectangular Footing.
9. Design of Combined Footings.
10. Design of Water Tank.

TOTAL: 30 HOURS

REFERENCES:

1. *Krishna Raju N, "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi,*

2015.

2. *N. Krishna Raju, Structural Design and Drawing: Reinforced Concrete and Steel. 2nd Revised Edition - 17 January 2005.*
3. *Krishnamoorthy, C.S. and Rajeev, S., Computer Aided Design and Analytical Tools, Narosa, 2008.*
4. *Donald P. CodutoFoundation Design : Principles And Practices, 2nd Edn Paperback – 1 January 2014*

2302CE553	SURVEY CAMP	L	T	P	C
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PREREQUISITE:

1. Surveying Laboratory

COURSE OBJECTIVES:

1. One week Survey Camp will be conducted during summer vacation in the following activities using Theodolite, cross staff, leveling staff, tapes, chain, plane table and totalstation.
2. Thecampmustinvolveworkonalargeareaofnotlessthan400hectares. At the end of the camp, each student shall have mapped and contoured the area.
3. The camp record shall include all original field observations, calculations and plots.

COURSE OUTCOMES:

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

CO1: Measure the areas by using triangulation method.
CO2: Measure the areas by LS & CS method.
CO3: Formation and marking the foundation of various simple structures.
CO4: Formation and setting out the simple curves in field.
CO5: Find out the contouring of area in a hilly region and block contouring.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	3	3	2	2	3	2	2	2	-	3	3	-
CO2	3	2	-	3	3	2	2	3	2	2	2	-	3	3	-
CO3	3	3	2	3	2	3	2	2	2	2	2	-	3	3	-
CO4	3	3	2	-	2	2	2	2	2	2	2	-	3	3	-
CO5	3	3	2	-	3	2	2	2	-	2	2		3	3	-

LIST OF EXPERIMENTS:

1. Triangulation.
2. Longitudinal Section & Cross Section (LS & CS).
3. Setting out a simple curve.
4. Setting out of a Building.
5. Contouring(HillSurvey).
6. Block Contouring

TOTAL: 30 HOURS

EVALUATIONPROCEDURE

1. Conduct of Experiment: 30
2. Mid Term Presentation: 20
3. EvaluationofSurveyCampReport:30marks

4. Final Presentation:20marks

REFERENCES:

1. KanetkarT.P.,SurveyingandLevelling,Vols.IandII,UnitedBookCorporation,Pune,1994.
2.BannisterA.andRaymondS.,Surveying,ELBS,SixthEdition,1992.
3.PunmiaB.C.Surveying,Vols.I,IIandIII,LaxmiPublications,1989.