

E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade | Accredited by NBA

NAGAPATTINAM – 611 002



B.E. Civil Engineering

Third Year – Sixth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1702CE601	Structural Analysis II	3	2	-	4	40	60	100
1702CE602	Concrete Structures II	3	-	-	3	40	60	100
1702CE603	Design of Steel Structures	3	-	-	3	40	60	100
1702CE604	Water Supply Engineering	3	-	-	3	40	60	100
1703CE009	Ground Water Engineering(Elective III)	3	-	-	3	40	60	100
	Elective IV (Open)	3	-	-	3	40	60	100
Laboratory Course								
1702CE651	Concrete and Highway Engineering Lab	-	-	2	1	50	50	100
1702CE652	Environmental and Irrigation Design and Drawing	-	-	4	2	50	50	100
1704CE653	Mini Project II	-	-	2	1	100	-	100
1704CE654	Industrial Visit Presentation	-	-	-	1	100	-	100
1704GE651	Life Skills: Aptitude II	-	-	2	-	100	-	100

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1702CE601	STRUCTURAL ANALYSIS II	L	T	P	C
		3	2	0	4

PREREQUISITE:

Structural analysis I
Strength of materials

Course Objectives:

1. To obtain the ability to analyze indeterminate beams and rigid frames by Flexibility and Stiffness Matrix method.
2. To develop a clear understanding of Displacement functions in Structural element by Finite Element method.
3. To know the concept of plastic structures and analysis of space and Cable structures.

Unit I MATRIX FLEXIBILITY METHOD 12 Hours

Equilibrium and compatibility- Determinate Vs- indeterminate structures – Indeterminacy – Primary structure – Compatibility conditions – Analysis of indeterminate continuous beams, rigid jointed plane frames (with redundancy restricted to two).

Unit II STIFFNESS MATRIX METHOD 12 Hours

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of rigid frames (with redundancy limited to two)

Unit III PLASTIC ANALYSIS OF STRUCTURES 12 Hours

Statically indeterminate axial problems – beams in pure bending – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames

Unit IV INTRODUCTION TO FINITE ELEMENT ANALYSIS 12 Hours

Introduction- Steps involved in FEA – Displacement functions – truss element – beam element – Triangular elements.

Unit V SPACE AND CABLE STRUCTURES 12 Hours

Analysis of Space trusses using method of tension coefficients – suspension bridges with two and three hinged stiffening girders.

TOTAL: 60 HOURS

Further Reading:

1. To analyze and find out the BMD.
2. To analyze the indeterminate structures.

REFERENCES:

1. Punmia, B.C., Ashok Kumar and Arun Kumar Jain, “ Theory of Structures”, Laxmi Publications, 2005.
2. Vaidyanathan, R. and Perumal, P., “Comprehensive structural Analysis – Vol I & II”, Laxmi Publications, New Delhi, 2003.
3. Negi L.S & Jangid R.S., “Structural Analysis”, Tata McGraw Hill Publications, New Delhi, 2003.
4. Ghali, A., Nebille, A.M. and Brown, T.G, “Structural Analysis” A unified classical and Matrix approach”, 6th Edition, Spon Press, London and New York, 2013.
5. Gambhir, M.L., “Fundamentals of Structural Mechanics and Analysis”, PHI Learning Pvt. Ltd., New Delhi, 2011.
6. William Weaver Jr & James M. Gere, “Matrix Analysis of Framed Structures”, CBS Publishers and Distributors, New Delhi, 2004

1702CE602	CONCRETE STRUCTURES II	L	T	P	C
		3	0	0	3

PREREQUISITE:

Concrete technology
Concrete structures I

COURSE OBJECTIVES:

1. To develop an understanding on the basic concepts in the behavior and design of reinforced concrete structures such as Retaining Wall and counterfort retaining wall.
2. To provide knowledge on design of various components in the water tank by working stress method.
3. To provide knowledge on design of various reinforced concrete structures such as staircases, flat slabs and RC walls.
4. To expose the basic concepts about the yield line theory for the analysis and design of slab of various cross sections.
5. To expose the behavior of masonry structures, and be able to design for various loading conditions.

UNIT I RETAINING WALLS

09 Hours

Retaining walls - types - earth pressure - effects of surcharge - Stability requirements - Cantilever and counterfort retaining walls - detailing of reinforcement.

UNIT II WATER TANKS

09 Hours

R.C water tanks resting on ground - general design requirements – Overhead circular and rectangular tanks - Analysis and design is using working stress method - detailing of reinforcement - codal provisions.

UNIT III STAIRS, FLAT SLABS AND WALLS

09 Hours

Staircases - Ordinary and Doglegged – Flat slabs - Direct design method – Reinforced concrete walls.

UNIT IV YIELD LINE THEORY

09 Hours

Yield line – Assumptions – Characteristics – Upper bound and lower bound theories - Yield line analysis - Design of slabs.

UNIT V BRICK MASONRY

09 Hours

Introduction - classification of walls - Lateral supports and stability - effective height of wall and columns - effective length of walls - Design loads, load dispersion - Permissible stresses - design of axially and eccentrically loaded brick walls.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Retaining and storage structures
2. Design of shear walls, deck bridges.

REFERENCES:

1. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain “Limit State Design of Reinforced Concrete”, Laxmi Publications (P) Ltd, New Delhi 2007
2. Dayaratnam, P., “Brick and Reinforced Brick Structures”, Oxford & IBH Publishing House, 1997.
3. Unnikrishna Pillai, S., Devdas Menon, “Reinforced Concrete Design”.

1702CE603	DESIGN OF STEEL STRUCTURES	L	T	P	C
		3	0	0	3

PREREQUISITE:

Engineering Mechanics
Workshop Practices Lab

COURSE OBJECTIVES:

- 1.To learn the properties of steel sections and design basics and codal provisions- Design of connections
2. To design steel members subjected to tension and compression member.
- 3.Design steps involved in beams, built up beams and design of plate girder

Unit I INTRODUCTION 09 Hours

Structural steel sections – Limit state design concepts - Connections- bolted and welded joints - Failure of joints - Efficiency of joints - Eccentric connections

Unit II TENSION MEMBERS 09 Hours

Types of sections – Net area – net effective sections for angles and Tee in tension – Design of connections in tension members – use of lug angles – Design of tension splice – Concept of Shear lag.

Unit III COMPRESSION MEMBERS 09 Hours

Effective length about major and minor principal axis - I.S code provisions- permissible stresses - Design rules- design of one component - two components and built up compression members under axial load- Design of Lacings and Battens - Different types of column bases - Slab base and Gusseted base - connection details

Unit IV BEAMS 09 Hours

Design of laterally supported and unsupported beams – Built up beams – design of Plate Girders – Intermediate and bearing stiffeners – Web splicing.

Unit V INDUSTRIAL STRUCTURES 09 Hours

Design of roof trusses – Elements of roof trusses – Design of purlins – Estimation of wind loads – Design of gantry girders

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

Advanced steel structures / Composite steel structures

REFERENCES:

1. S.S. Bhavikatti ,”Design of Steel Structures”, I. K. International Pvt Ltd, 2009.
2. Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., “Design of Steel Structures”, 3rd edition, McGraw-Hill Publications, 1992
3. Negi L.S.” Design of Steel Structures”, Tata McGraw Hill Publishing Pvt Ltd, New Delhi, 2007.

1702CE604	WATER SUPPLY ENGINEERING	L	T	P	C
		3	0	0	3

PREREQUISITE:

Environmental Science
Engineering Chemistry

COURSE OBJECTIVES:

1. To examine the water supply system and conveyance system.
2. To create an ability to evaluate the water treatment and advanced water treatment system.
3. To train the students to analyze water distribution system and supply to buildings.

Unit I PLANNING FOR WATER SUPPLY SYSTEM 08 Hours

Public water supply system -Planning -Design period - Water demand - Population forecasts -Sources of water and their characteristics -Surface and Groundwater- Development and selection of source - Water quality - Characterization and standards.

Unit II CONVEYANCE SYSTEM 07 Hours

Intake structures -Pipes and conduits for water- Pipe materials& selection- appurtenances - Hydraulics of flow in pipes -Transmission main design - Laying, jointing and testing of pipes - Types and capacity of pumps - Selection of pumps.

Unit III WATER TREATMENT 12 Hours

Objectives - Unit operations and processes - Principles, functions design and drawing of Screens, Flash mixers, flocculators, sedimentation tanks and sand filters - Disinfection- Residue Management.

Unit IV ADVANCED WATER TREATMENT 09 Hours

Aerator - Iron and manganese removal, Defluoridation and demineralization -Water softening - Desalination - Membrane Systems-Construction and Operation & Maintenance aspects of Water Treatment Plants.

Unit V WATER DISTRIBUTION AND SUPPLY TO BUILDINGS 09 Hours

Requirements of water distribution -Components -Service reservoirs -Functions and drawings -Network design - Analysis of distribution networks -Pipe Appurtenances -operation and maintenance -Leak detection, Methods. House service connection - Systems of plumbing.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Apply an appropriate unit system for the water treatment.
2. Estimate the quantity of wastewater and storm run-off generated from the town/ city and design a suitable collection system for the generated wastewater.

REFERENCES:

1. Garg, S.K., "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi, 2005.
2. Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2005.
3. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2005
4. Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2003
5. Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.

1703CE009	GROUNDWATER ENGINEERING	L	T	P	C
		3	0	0	3

PREREQUISITE:

Applied Geology
Geotechnical Engineering

COURSE OBJECTIVES:

1. To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers.
2. Characteristics of different aquifers.
3. To understand the techniques of development and management of groundwater

Unit I HYDROGEOLOGICAL PARAMETERS 9 Hours

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Ground water table fluctuation and its interpretations

Unit II WELLHYDRAULICS 9Hours

Objectives of Ground water hydraulics–Darcy’s Law–Ground water equation–steady state flow Dupuit Forchheimer assumption–Unsteady state flow–Theis method–Jacob method–Slug tests –Image well theory – Partial penetrations of wells

Unit III GROUNDWATERMANAGEMENT 9Hours

Need for Management Model – Database for groundwater management –groundwater balance study – Introduction to Mathematical model – Conjunctive use – Collector well and Infiltration gallery

Unit IV GROUNDWATER QUALITY 9 Hours

Ground water chemistry - Origin, movement and quality - Water quality standards – Health and aesthetic aspects of water quality - Saline intrusion – Environmental concern and Regulatory requirements

Unit V GROUNDWATER CONSERVATION 9 Hours

Artificial recharge techniques – Remediation of Saline intrusion– Protection zone delineation, Contamination source inventory, remediation schemes- Ground water Pollution and legislation.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Analysis and remedial measures of Groundwater in future.
2. Water resource and hydrology for future needs.

REFERENCES:

1. Raghunath,H.M.,GroundWaterHydrology,Wiley Eastern Ltd.,2000.
2. ToddD.K.,GroundWaterHydrology,JohnWileyandSons,2000
3. Ramakrishnan, S, Groundwater , K.J. Graph arts, Chennai, 1998
4. Walton, C, Applied Hydrology, Ground Water Resource Evaluation, McGraw-HillPublications,1996
5. Karanth,GroundWaterAssessment,DevelopmentandManagement,TataMcGrawHill,NewDelhi2006

1702CE651	CONCRETE AND HIGHWAY ENGINEERING LAB	L	T	P	C
		-	-	2	1

PREREQUISITE :

Transportation Engineering
Building Materials

COURSE OBJECTIVES:

1. This course provides an understanding of the basic properties of construction materials, and presents laboratory standards and testing requirements for these materials.
2. To familiarize the students to do the experiments as per the guidelines of BIS.
3. To develop an understanding of the highway materials and to obtain knowledge on properties of these materials.

LIST OF EXPERIMENTS:

1. Tests on aggregates
 1. Determination of Specific gravity and water absorption of coarse aggregates.
 2. Determination of Fineness modulus of coarse aggregate.
 3. Determination of Flakiness and elongation index of coarse aggregate.
2. Tests on fresh and hardened concretes
 1. Determination of degree of workability: Slump cone test, Flow table, Compaction factor and Vee-bee Consistometer
 2. Determination of Compressive strength of concrete
 3. Determination of Flexural strength of concrete
 4. Determination of Split tensile strength of concrete
3. Tests on Highway materials- Sub-grade material and Aggregates
 1. Crushing value test, impact value test
 2. Marshall stability for bituminous mix
 3. Bitumen extractor for bituminous mix
4. Tests on Bitumen
 1. Penetration test
 2. Viscosity test.
 3. Ductility test.

TOTAL:45 HOURS

ADDITIONAL EXPERIMENTS/ INNOVATIVE EXPERIMENTS:

1. Softening point test on bitumen
2. Dorry abrasion test for tiles and other finishing materials

REFERENCES:

1. Shetty, M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003
2. Santhakumar, A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007
3. Gambir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
4. IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998
5. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 1995

1702CE652	ENVIRONMENTAL AND IRRIGATION DESIGN AND DRAWING	L	T	P	C
		0	0	4	2

PREREQUISITE:

Concrete Structures I
Engineering Chemistry

COURSE OBJECTIVES:

- 1.To know about the design of environmental structures
- 2.To know the pictorial representation of irrigation structures

Unit I WATER SUPPLY AND TREATMENT 08 Hours

Design & Drawing of flash mixer, flocculator, clarifier – Slow sand filter – Rapid sand filter –Infiltration gallery – Intake towers – Service reservoirs – Pumping station – House serviceconnection for water supply and drainage.

Unit II SEWAGE TREATMENT & DISPOSAL 07 Hours

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank & oxidation ditch – Trickling filters – Secondary clarifiers – Sludge digester – Sludge drying beds – Waste stabilization ponds - Septic tanks and disposal arrangements – Manholes.

Unit III IMPOUNDING STRUCTURES 12 Hours

Gravity dam, Tank Surplus Weir, Tank Sluice with tower road – Drawing showing plan, elevation, half section including foundation details.

Unit IV CANAL TRANSMISSION STRUCTURES 09 Hours

Aqueducts – Syphon Aqueducts – Super passage – Canal siphon – Canal Drops- Drawing showing plan, elevation and foundation details.

Unit V CANAL REGULATION STRUCTURES 09 Hours

Canal head works- Canal Regular – Canal escape- Proportional Distributors – Drawing showing detailed plan, elevation and foundation.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

- 1.To analyze advanced irrigation and environmental structures
2. Design and draw irrigation and environmental structures

REFERENCES:

- 1.Garg, S.K., "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi, 2005.
- 2.Sathyanarayana Murthy "Irrigation Design and Drawing" Published by Mrs.L.Banumathi, Tuni east Godavari District. A.P. 1998
- 3.Sharma R.K. Irrigation Engineering and Hydraulic Structures Oxford and IBH Publishing co., New Delhi 2002.
- 4.Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2005.
- 5.Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2005
- 6.Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2003
- 7.Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.

1704CE653

MINI PROJECT II

0 0 2 1

Aim: To carry out a thematic design project in one of the specializations of civil engineering

Course Objectives:

The student should be made to:

To carry out a project which will make the students aware of the different facets of Civil Engineering.

List of areas

1. Geometrics Engineering and Surveying
2. Construction practice
3. Transportation engineering

Geometrics Engineering and Surveying

Prepare central line diagram of buildings and laying out at site, Establishment of reduced levels of important points in an area, Preparing the layout of a small area by means of compass / theodolite surveying, Preparing LS / CS of an alignment..

Construction practice

Bar bending schedule of beam, column, lintel, sunshade, roof slab, footing, stair case with construction practice.

Transportation engineering

Carry out objective oriented traffic survey, carrying out surveys on bus routes – stopping time, ticketing time etc. Carrying out testing of highway making materials, Preparation of schematic intersection layouts, grade separators etc.

1704CE654

INDUSTRIAL VISIT PRESENTATION

0 0 2 1

In order to provide the experiential learning to the students, shall take efforts to arrange at least two industrial visit / field visits in a year. A presentation based on Industrial visits shall be made in this semester and suitable credit may be awarded.

1704GE651

LIFE SKILLS: APTITUDE II

L	T	P	C
0	0	2	1

PREREQUISITE :

Aptitude I
Communication English

COURSE OBJECTIVES:

1. To brush up problem solving skill and to improve intellectual skill of the students
2. To be able to critically evaluate various real life situations by resorting to Analysis Of key issues and factors
3. To be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
4. To enhance analytical ability of students
5. To augment logical and critical thinking of Student

Unit I Partnership, Mixtures and Allegations, Problem on Ages, Simple Interest, Compound Interest 6 Hours

Introduction Partnership - Relation between capitals, Period of investments and Shares- Problems on mixtures - Allegation rule - Problems on Allegation – Problems on ages - Definitions Simple Interest - Problems on interest and amount - Problems when rate of interest and time period are numerically equal - Definition and formula for amount in compound interest - Difference between simple interest and compound interest for 2 years on the same principle and time period.

Unit II Blood relations, , Clocks, Calendars 6 Hours

Defining the various relations among the members of a family - Solving Blood Relation puzzles - Solving the problems on Blood Relations using symbols and notations - Finding the angle when the time is given - Finding the time when the angle is known - Relation between Angle, Minutes and Hours - Exceptional cases in clocks - Definition of a Leap Year - Finding the number of Odd days - Framing the year code for centuries - Finding the day of any random calendar date

Unit III Time and Distance, Time and Work 6 Hours

Relation between speed, distance and time - Converting kmph into m/s and vice versa - Problems on average speed - Problems on relative speed - Problems on trains - Problems on boats and streams - Problems on circular tracks - Problems on races - Problems on Unitary method - Relation between Men, Days, Hours and Work - Problems on Man-Day-Hours method - Problems on alternate days - Problems on Pipes and Cisterns.

Unit IV Data Interpretation and Data Sufficiency 6 Hours

Problems on tabular form - Problems on Line Graphs - Problems on Bar Graphs - Problems on Pie Charts - Different models in Data Sufficiency - Problems on data redundancy

Unit V Analytical and Critical Reasoning 6 Hours

Problems on Linear arrangement - Problems on Circular arrangement - Problems on Double line-up - Problems on Selections - Problems on Comparisons - Finding the Implications for compound statements - Finding the Negations for compound statements- Problems on assumption - Problems on conclusions - Problems on inferences - Problems on strengthening and weakening of arguments .

Total: 30 Hours

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

To face the competitive examinations

REFERENCES:

1. Arun Sharma, 'How to Prepare for Quantitative Aptitude for the CAT', 7th edition, McGraw Hills publication, 2016.
2. Arun Sharma, 'How to Prepare for Logical Reasoning for CAT', 4th edition, McGraw Hills publication, 2017.
3. R S Agarwal, 'A modern approach to Logical reasoning', revised edition, S.Chand publication, 2017.
4. R S Agarwal, 'Quantitative Aptitude for Competitive Examinations', revised edition, S.Chand publication, 2017.
5. Rajesh Verma, "Fast Track Objective Arithmetic", 3rd edition, Arihant publication, 2018.
6. B.S. Sijwali and InduSijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition, Arihant publication, 2014.