E.G.S.PILLAYENGINEERINGCOLLEGE

(Autonomous)

Approved byAICTE,New Delhi|Affiliated to AnnaUniversity,
Chennai AccreditedbyNAAC with „A"Grade|Accredited byNBA
(CSE, EEE, MECH, ECE, CIVIL, IT)

NAGAPATTINAM–611002

B.E. Civil Engineering

FullTime Curriculum and Syllabus

Third Year – Sixth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks			Category
						CA	ES	Total	
Theory Course									
1902CE601	Structural Analysis II	3	0	0	3	40	60	100	PC
1902CE602	Design of RCC Structures II	3	0	0	3	40	60	100	PC
1902CE603	Hydrology And Water Resources Engineering	3	0	0	3	40	60	100	PC
1902CE604	Global Warming And Climate Change **(Open Elective)**	3	0	0	3	40	60	100	PE
1903CE007	Remote Sensing And GIS **(PC Elective)**	3	0	0	3	40	60	100	PCE
1901MGX01	Total Quality Management **(HSS Elective)**	3	0	0	3	40	60	100	HSSE
Laboratory Course									
1902CE651	Computer Aided Design And Drafting Lab	0	0	2	1	50	50	100	PC
1904GE651	Life Skill : Aptitude – II & GD	0	0	2	1	100	-	100	HSS

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

1902CE601	STRUCTURAL ANALYSIS II	L	T	P	C
		3	0	0	3

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** **9 Hours**

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

Unit II **STIFFNESS MATRIX METHOD** **9 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 pin-jointed plane frames and rigid frames (with redundancy limited to two)

Unit III **PLASTIC ANALYSIS OF STRUCTURES** **9 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** **9 Hours**

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

Unit V **SPACE AND CABLE STRUCTURES** **9 Hours**

Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables – suspension bridges with two and three hinged stiffening girders.

Total: 45 Hours

Further Reading:

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

Course Outcomes:

After completion of the course, Student will be able to

1. Analyze structures using matrix flexibility method.
2. Analyze structures using stiffness method.
3. Perform plastic analysis for indeterminate beams and frames.
4. Implement basic concepts of finite element analysis.
5. Analyze Space Truss using tension Coefficient method and beams curved in plan and cable suspension bridges.

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

1902CE602	DESIGN OF RCC STRUCTURES - II	L	T	P	C
		3	0	0	3

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**	**9 Hours**

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

Unit II	**WATER TANKS**	**9 Hours**

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

Unit III	**STAIRS AND CONCRETE WALLS**	**9 Hours**

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

Unit IV	**YIELD LINE THEORY**	**9 Hours**

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

Unit V	**BRICK MASONRY**	**9 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 :

1.Students can be able to work on retaining and storage structures

2. Students can be able to design shear walls, deck bridges.

Course Outcomes:

After completion of the course, Student will be able to

1.Design various types of retaining walls under various loading conditions

2.Design and detailing of different types of water tanks along with the staging and foundation.

3.Attain sufficient knowledge of design for staircases, flat slabs and reinforced concrete walls and gain knowledge about the principles of design of mat foundation, box culvert and road bridges

4.Apply the yield line theory for design of square, rectangular, circular and triangular slabs.

5.Design axially and eccentrically loaded brick walls based on the knowledge gained for various loading conditions

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. UnnikrishnaPillai, S., DevdasMenon, “Reinforced Concrete Design”.

1902CE603	HYDROLOGY AND WATER RESOURCES ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

To introduce the student to the concept of hydrological aspects of water availability and requirements and should be able to quantify, control and regulate the water resources.

Unit I	PRECIPITATION AND ABSTRACTIONS	9 Hours

Hydrological cycle-Meteorological measurements–Requirements, types and forms ofprecipitation-Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods-Interception-Evaporation. Horton‟s equation, pan evaporation measurements and evaporation suppression-Infiltration-Horton‟s equation-double ring infiltrometer, infiltration indices

Unit II	RUNOFF	9 Hours

Watershed, catchment and basin-Catchment characteristics-factors affecting runoff-Run off estimation using empirical-Strange‟s table and SCS methods–Stage discharge relationships flow measurements-Hydrograph–Unit Hydrograph–IUH

Unit III	FLOOD AND DROUGHT	9 Hours

Natural Disasters-Flood Estimation-Frequency analysis-Flood control-Definitions of droughtsMeteorological, hydrological and agricultural droughts-IMD method-NDVI analysis-Drought Prone Area Programme (DPAP)

Unit IV	RESERVOIRS	9 Hours

Classification of reservoirs, General principles of design, site selection, spillways, elevation–area-capacity-storage estimation, sedimentation-life of reservoirs–rule curve

Unit V	GROUNDWATER AND MANAGEMENT	9Hours

Origin-Classification and types-properties of aquifers-governing equations–steady andunsteady flow-artificial recharge-RWH in rural and urbanareas

Total:	45 Hours

Further Reading:

1. How to prepare data for GIS and RS
2. Civil engineering application for various fields

Course Outcomes:

After completion of the course, Student will be able to

1. Explain the key drivers on water resources, hydrological processes andtheir integrated behavior in catchments
2. Make use of hydrological models to surface water problemsincluding basin characteristics, runoff and Hydrograph
3. Outline the concept of hydrological extremes such as Flood and Droughtand management strategies
4. Describe the importance of spatial analysis of rainfall and design water storage reservoirs
5. Illustrate the concepts of groundwater for water resources management

References:

Subramanya .K. "Engineering Hydrology"-Tata McGraw Hill, 2010

David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007

VenTe Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw HillInternational Book Company, 1998.

Raghunath .H.M., "Hydrology", Wiley Eastern Ltd., 1998

1903CE007 REMOTE SENSING AND GIS **L T P C**
3 0 0 3

Module I	**EMR AND ITS INTERACTION WITH ATMOSPHERE & EARTH MATERIAL**	**9**
Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein's 74 Displacement Law- Atmospheric scattering, absorption-Atmospheric windows-spectral signature concept-typical spectral reflective characteristics of water, vegetation and soil.		
Module II	**PLATFORMS AND SENSORS**	**9**
Types of platforms – orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors – Resolution concept – Pay load description of important Earth Resources and Meteorological Satellites – Airborne and space borne TIR and microwave sensors.		
Module III	**IMAGE INTERPRETATION AND ANALYSIS**	**9**
Types of Data Products – types of image interpretation – basic elements of image interpretation – visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and Unsupervised.		
Module IV	**GEOGRAPHIC INFORMATION SYSTEM**	**9**
Introduction – Maps – Definitions – Map projections – types of map projections – map analysis – GIS definition – basic components of GIS – standard GIS softwares – Data type – Spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS).		
Module V	**DATA ENTRY, STORAGE AND ANALYSIS**	**9**
Data models – vector and raster Data – data ompression – data input by digitization and scanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information System – Monitoring and Modeling using GIS .		
		TOTAL: 45 Periods

Course Outcomes: After completion of the course, Student will be able to			
CO1	Understand the principles of aerial and satellite remote sensing, the energy interactions with earth surface features, spectral properties of water, vegetation and soil.		
CO2	Understand the basic concept of Remote Sensing and different types of platforms and sensors.		
CO3	Analyze the concept of image interpretation and digital image processing.		
CO4	Apply the basic concept of GIS applications through standard GIS software's, different types of data representation in GIS.		
CO5	Apply knowledge of GIS software and work with GIS software in various application fields.		
Sl. No.	**Title of the Book**	**Author(s)**	**Publisher**
REFERENCES			
R1	Concepts and Techniques of Geographic Information Systems	Lo.C.P. &A.K.W.Yeung	Prentice Hall of India Pvt. Ltd., 2002
R2	Principles of GIS	Peter A.Burrough&Racheal A. McDonnell	Oxford University Press, 2000
R3	An Introduction to GIS	Ian Heywood	Pearson Education Asia, 2000
REFERENCE WEBSITES			
1	http://www.academicearth.org/courses/introduction-to-robotics		

2	http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv071-Page1.htm
3	http://www.informationweek.com/news/galleries/healthcare/patient/229100383

1901MGX01	**TOTAL QUALITY MANAGEMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objectives:	To facilitate the understanding of Quality Management principles and process.

Unit I	**INTRODUCTION**	**9 Hours**

Introduction – Need for quality – Evolution of quality – Definitions of quality – Dimensions of product and service quality – Basic concepts of TQM – TQM Framework – Contributions of Deming, Juran and Crosby – Barriers to TQM – Quality statements – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention – Costs of quality.

Unit II	**TQM PRINCIPLES**	**9 Hours**

Leadership – Strategic quality planning, Quality Councils – Employee involvement – Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal – Continuous process improvement – PDCA cycle, 5S, Kaizen – Supplier partnership – Partnering, Supplier selection, Supplier Rating

Unit III	**TQM TOOLS AND TECHNIQUES I**	**9 Hours**

The seven traditional tools of quality – New management tools – Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

Unit IV	**TQM TOOLS AND TECHNIQUES II**	**9 Hours**

Control Charts – Process Capability – Concepts of Six Sigma – Quality Function Development (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures.

Unit V	**QUALITY SYSTEMS**	**9Hours**

Need for ISO 9000 – ISO 9001-2008 Quality System – Elements, Documentation, Quality Auditing – QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors.. TOTAL: 45 PERIODS OUTCOMES : x The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

	Total:	**45 Hours**

Further Reading:	
	1. Engineering economics and cost analysis
	2. Construction and planning management

Course Outcomes:	
	After completion of the course, Student will be able to
	1. Understand the concepts, dimension quality and philosophies of TQM.
	2. Understand the principles of TQM and its strategies.
	3. Apply seven statistical quality and management tools.
	4. Understand TQM tools for continuous improvement.
	5. Understand the QMS and EMS.

References:

6. Dale H.Besterfield et al, Total Quality Management, Third edition, Pearson Education (First Indian Reprints 2004).
7. ShridharaBhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition 2002.

1902CE604	GLOBAL WARMING AND CLIMATE CHANGE	L	T	P	C
		3	0	0	3

Course Objectives:

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

Unit 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.

Unit II	MITIGATION MEASURE, EMISSION TARGETS AND CARBON TREADING	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

Unit 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.

Unit IV	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.

Unit V	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.

	Total:	45 Hours

Course Outcomes:

After completion of the course, Student will be able to

1. Outline the principle involved in the greenhouse gas emission.
2. Explain the carbon emission and its mitigation methods.
3. Illustrate about the climate variability parameters.
4. Describe the climate components and the circulation system.
5. Discuss about the physical processes involved in the climate system.

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). This book is also available as a free online edition at r4ds.had.co. nz/.

1902CE651	COMPUTER AIDED DESIGN AND DRAFTING LAB	L	T	P	C
		0	0	2	1

Course Objectives:

1. To learn the software developing skills for structural design
2. To understand the computing skills in the field of geotechnical engineering.
3. To study the different software packages for analysis and design

List of Experiments:

1. Design of building elements (RC)-Standard method of detailing RC beams, slabs and columns – Special requirements of detailing with reference to erection process.
2. Design of Industrial Buildings - Steel roof trusses
3. Design of Overhead water tanks (RC & Steel)
4. Design of box culvert and slab bridges
5. Design of steel chimneys

Total: 45 Hours

Additional Experiments:

1. Transportation planning process- Trip generation and distribution- Network analysis - Shortest path algorithms
2. Water resources - Pipe networks - Canal design - Backwater profile - Synthetic derivation of stream flows using random numbers - Dam stability

Course Outcomes:

After completion of the course, Student will be able to

1. Learn software developing skills for structural design
2. Study the different software packages for analysis and design
3. Use computer software to model any type of structure
4. Compute loads and use computer software to analyse a structure
5. Use computer software to design a structure based on is codal provisions.

References:

1. Krishna Raju N, "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2003.
2. Krishna Raju N, Structural Design and Drawing (Reinforced Concrete and Steel). University press, Hyderabad, 2006
3. Krishnamoorthy, C.S. and Rajeev, S., Computer Aided Design and Analytical Tools, Narosa, 1993.
4. Papacostas, C.S., Fundamentals of Transportation Engineering Prentice-Hall of India, 2001
5. Loucks, D.P., Stedinger, J.R. and Haith, D.A., Water Resource Systems Planning and Analysis, Prentice-Hall INC, 1981.

LIFE SKILL IV - APTITUDE – II & GD

1904GE651

Course Objective (s):

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

Unit 1	**Profit and Loss Simple Interest, Compound Interest**	**6 Hours**
Problems on Profit and Loss percentage- Relation between Cost Price and Selling price - Discount and Marked Price - Two different articles sold at same Cost Price - Two different articles sold at same Selling Price - Gain% / Loss% on Selling Price - 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 2	**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 3	**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 4	**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 5	**Analytical Reasoning**	**6 Hours**
Problems on Linear arrangement - Problems on Circular arrangement - Problems on Double line-up - Problems on Selections - Problems on Comparisons		
		Total 30 Hours

COURSE OUTCOMES:

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

CO1: Implement business transactions using profit and loss & Interest Calculation.

CO2:Workout family relationships concepts, ability to visualize clocks & calendar and understand the logic behind a Sequence.

CO3:Calculate concepts of speed, time and distance, understand timely completion using time and work.

CO4: Learners should be able to understand various charts and interpreted data least time.

CO5 : Workout puzzles, ability to arrange things in an orderly fashion.

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. Sijwalii and InduSijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition, Arihnat publication, 2014.