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 (CSE, EEE, MECH, IT, ECE, CIVIL)

NAGAPATTINAM – 611002

B.E. CIVIL ENGINEERING

FINAL YEAR-Seventh Semester

Course Code	Course Name	L	T	P	C	Maximum Marks			Category
						CA	ES	Total	
Theory Course									
1902CE701	Estimation & Quantity Surveying	3	0	0	3	40	60	100	PC
1901MGX07	Universal Human Values and Ethics	3	0	0	3	40	60	100	HSS
1903CE009	Repair And Rehabilitation Of Structures**(PC Elective)**	3	0	0	3	40	60	100	PEC
1903CE033	Water Pollution and Management**(Open Elective)**	3	0	0	3	40	60	100	POE
1901HS002	Intellectual Property Rights for engineers **(HSS Elective)**	3	0	0	3	40	60	100	HSSE
1901HS006	Design Thinking For Innovation **(HSS Elective)**	3	0	0	3	100	-	100	HSSE
Laboratory Course									
1904GE751	Life skills - Comprehensive Viva	2	0	0	2	100	-	100	EEC
1902CE751	In-Plant Training / Internship Presentation	0	0	2	1	50	50	100	EEC

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

1902CE701	**ESTIMATION & QUANTITY SURVEYING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objectives:

1. To provide the student with the ability to estimate the quantities of item of works involved in buildings
2. To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works
3. Interpret the quantities and rates of work required for the given specification and explain the various the types of contract documents and tender.
4. Identify the value of the building
5. Outline the principles and report preparations on estimate of residential buildings, culverts, roads, water supply and wells.

Unit I **PROCEDURE OF ESTIMATION QUANTITY** **9 Hours**

Introduction– Estimate–Types of Estimates–Units of measurements–Methods of building estimate– calculation of quantities of earthwork, stone masonry, brick masonry, plastering, cement concrete, R.C.C, PCC, Doors, Windows, Flooring, White Washing, color washing and painting Nourishing for load bearing structures and framed structures.

Unit II **ESTIMATE OF OTHER STRUCTURES** **9Hours**

Estimating of septic tank, soak pit–sanitary and water supply installations–water supply pipe line– sewerline–tubewell–openwell–estimateofbituminousandcementconcreteroads–estimateof retaining walls– culverts.

Unit III **SPECIFICATION AND TENDERS** **9Hours**

Data–Schedule of rates–Analysis of rates–Specifications–sources– Preparation of detailed and general specifications – Tenders – TTT Act – e-tender– Preparation of Tender Notice and Document–Contracts– Typesofcontracts–Draftingofcontractdocuments–Arbitrationand legal requirements.

Unit IV **VALUATION** **9 Hours**

Necessity–Basics of value engineering – Capitalized value –Depreciation–Escalation–Value of building– Calculation of Standard rent –Mortgage–Lease.

Unit V **REPORTPREPARATION** **9 Hours**

Principlesforreportpreparation–reportonestimateofresidentialbuilding–Culvert–Roads – Water supply and sanitary installations–Tube wells – Open wells.

Total: 45 Hours

Further Reading:

1. Effective cost of good quality of building in civil engineering world.
2. Estimation of bridge ,road, culvert and other special structure using some software

Course Outcomes: The student shall be able to estimate

1. The material quantities, prepare a bill of quantities, make specifications and prepare tender documents. Student shall be able to prepare value estimates.
2. To know the importance of preparing the types of estimates under different conditions
3. To apply logical thoughts and prepare the rate analysis and bills
4. To analyze and synthesize cost effective approach for civil engineering projects
5. To comprehend detailed report on estimation and valuation process

References:

1. Dutta,B.N.,EstimatingAndCosting,SDutta&Co.,Lucknow2006.
2. .Rangawala,S.C.,EstimatingAndCosting,CharotarAnandPublications,1996
3..Kohli,D.D.AndKohliR.C.,ATextBookOnEstimating,CostingAndAccounts, S.ChandAndCo,New Delhi,1994

1903CE009	REPAIR AND REHABILITATION OF STRUCTURES	L	T	P	C
		3	0	0	3

Course Objectives:

1. To make the students to gain knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.
2. To make the students to assess the durability of concrete due to various climate conditions
3. To prepare the students to select the appropriate rehabilitation, retrofitting and demolition for structures

Unit I — **MAINTENANCE AND REPAIR STRATEGIES** — **9 Hours**

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration

Unit II — **STRENGTH AND DURABILITY OF CONCRETE** — **9 Hours**

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness

Unit III — **SPECIAL CONCRETES** — **9 Hours**

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

Unit IV — **TECHNIQUES FOR REPAIR AND PROTECTION METHODS** — **9 Hours**

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection

Unit V — **REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES** — **9 Hours**

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Demolition Techniques - Engineered demolition methods - Case studies.

Total: 45 Hours

Course Outcomes:

After completion of the course, Student will be able to

1. Suggest maintenance and repair strategies
2. Examine the durability due to various climate conditions
3. Suggest the suitable materials and techniques for repair
4. Choose various rehabilitation and retrofitting techniques.
5. Select suitable demolition techniques for structures.

References:

1. 1.Shetty M.S., "Concrete Technology - Theory and Practice", S.Chand and Company, 2008
2. DovKominetzky.M.S., " Design and Construction Failures", Galgotia Publications Pvt.Ltd., 2001
3. Ravishankar.K., Krishnamoorthy.T.S, " Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
4. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.

1903CE033	WATER POLLUTION AND MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives:

1. To impart knowledge on the importance and necessity of water
2. To educate about the water pollution and its impact
3. To impart knowledge on water quality analyzing techniques
4. To make awareness in monitoring and management of water

Unit I	WATER RESOURCES	9 Hours

Necessity & properties of water –Water resources of the world and India –National Water Policy– Water cycle– Surface & subsurface sources –Water Quality Parameters – Standards.

Unit II	WATER POLLUTION	9 Hours

Sources – Classification, nature andToxicology of water pollutants –Ground water pollution–Ocean Pollution by toxic wastes– River pollution-A case study.

Unit III	EFFECTS OF WATER POLLUTION	9 Hours

Effects of waterpollutants on Human health– Ecologicaland Economic impacts of water pollution–Marine oilpollution and its impacts.

Unit IV	ANALYSIS & INSTRUMENTATION	9 Hours

Analysis of Pollutants: Titrimetry – Gravimetry – Spectrophotometry – Chromatographyand Flame techniques.Instrumentation: Principles and Applications of UV– VIS Spectrophotometer – Flame Photometer – Atomic Absorption Spectrophotometer –Gas Chromatography – GLC – HPLC.

Unit V	MONITORING & MANAGEMENT	9 Hours

Water quality monitoring–Water (Prevention and Pollution Control) act 1974 – Pollution control devices – Polluters pay principle.

Total: 45 Hours

Further Reading:

1. Water supply engineering
2. Waste water engineering

Course Outcomes:

After completion of the course, Student will be able

1. To describe about the sources of water and the quality standards
2. To identify the nature of pollutants and its source
3. To predict the effects of water pollution on biodiversity
4. To select the suitable analysis technique for the water quality parameter estimation
5. To select the accurate monitoring and management methods

References:

1. Laurent Hodges – Environmental Pollution
2. Willard, Merritt and Dean – Instrumental Analysis
3. APHA – Analysis of Water and Waste Water

1901HS002	INTELLECTUAL PROPERTY RIGHTS FOR ENGINEERS	L	T	P	C
		3	0	0	3

PREREQUISITE:

The course assumes no prior skill or background in design, art or engineering. This course covers the fundamental aspects of intellectual property (IP): copyright and related rights, trademarks, patents, geographical indications, and industrial designs. It also covers contemporary issues impacting the IP field such as: new plant varieties, unfair competition, enforcement of IP rights and emerging issues in IP.

COURSE OBJECTIVES:

1. A foundation in the basic concepts of IP
2. Better understanding of the relationship between IP and other policy areas such as health, climate change, traditional knowledge and emerging technologies
3. Practical learning experience in technology transfer and IP license negotiations
4. Experience of learning from renowned experts in a multicultural environment and joining an alumni of students sharing a similar interest in IP
5. The chance to identify areas for further IP study

Module I	Introduction	9 Hours

Overview of IP, Copyright, Trademarks, Geographical Indicators, Industrial Designs, Patents, Unfair competition, Enforcement of IP Rights, Emerging Issues in IP & IP Management

Module II	Copyrights &Trademarks	6 Hours

The concept, Case Study, Historical background, Principles, Notion of Work, Rights and Limitations, Formats & Filing Procedures

Module III	Geographical Indicators & Industrial Designs	6 Hours

The concept, Case Study, Historical background, Principles, Notion of Work, Rights and Limitations, Formats & Filing Procedures

Module IV	Patents	15 Hours

The Macro-Economic Impact of the Patent System, The Patent Application Process, The Different Layers of the International Patent System and Regional Patent Protection Mechanisms, Kinds of Intellectual Property Protection Based on Types of Inventions, Legal Issues of the Patenting Process, Enforcement, New Issues, Important Cases and Discussions, IP and Development - Flexibilities and Public Domain under Patents, Patent Search

Module V	Patent Cooperation Treaty	9 Hours

What is PCT? Use of PCT, Preparing a PCT Application, PCT Services, Patent Agent and Common Representatives, International Search, International Examination

TOTAL: 45 HOURS

Course Outcomes:

1. Explain various types of IPRs specific to Engineering
2. Explain concepts such as Copyrights, Trademarks, GIs and Industrial designs
3. Explain basic concepts of Engineering Patents
4. Explain concept of Patent Search and various methods to do it
5. Develop a sample PCT Application and explain examination procedures

FURTHER READING:

1. Intellectual Property Rights by Pandey Neeraj & DharniKhushdeep, 2014
2. Fundamentals of IPR: for students, Industrialist and patent lawyers, Ramakrishna B & Anil Kumar HS, 2017Drucker

REFERENCES:

1. Law relating to IPR by Dr MK Bandarai, Central Law Publication, 2014

2.Introduction to Intellectual Property Rights, H.S. Chawla, Oxfors& IBH Publishing, 2020

3. https://patents.google.comIntroduction to IPR books

Assessment Procedure: - Test-1 – 40%, Test-2 – 40%, Assignment – 20%

1901HS006	DESIGN THINKING FOR INNOVATION	L	T	P	C
		3	0	0	3

PREREQUISITE:

The course assumes no prior skill or background in design, art, engineering, or prototyping. It is open to all undergraduates and graduate students with an interest in learning design thinking, and is especially recommended for those students planning social-venture and other kinds of design interventions

COURSE OBJECTIVES:

1. Understand the terminology and conceptual models used in design disciplines
2. Understand how teaching and learning occurs in the design process
3. Recognize the ethical and social dilemmas and obligations of the practice of design
4. Diagnose common adoption barriers in individuals, groups and organizations.
5. Develop a design theory from independent and qualitative research and observations
6. Participate in and lead innovation in creative and collaborative settings
7. Undertake complex and unstructured problem-solving challenges in unfamiliar domains

Module I	Introduction to Design Thinking	8 Hours

Human Centered Design, Why Design Thinking, 5-Step Design Thinking Process, Applications, Creative Confidence, The culture of Innovation

Module II	Design Thinking Approach	12 Hours

IDEO's method of Design Thinking, Divergent Thinking & Innovation Funnel, Customer Journey Maps to uncover Innovation Opportunities, Case Study : Turing Creative Ideas into Viable Companies

Module III	Exploring Design Thinking Tool Kit	5 Hours

Discovery, Interpretation, Ideation, Experimentation, Evolution

Module IV	Design Challenge Project : Phase-1	5 Hours

Define a Challenge, Project Plan, How Might We statements, Project Timeline, Project Checklist

Module V	Design Challenge Project : Phase-2	15 Hours

Discovery – Understand the Challenge, Prepare Research, Gather Inspiration, Interpretation – Tell Stories, Search for meaning, Frame Opportunities, Ideation – Generate Ideas, Refine Ideas, Experimentation – Make Prototypes, Get Feedback, Evolution – Track Learnings, Engage Others

TOTAL: 45 HOURS

Course Outcomes:

1. Describe Key Concepts and basics of Design Thinking Principles
2. Elaborate the Design Thinking Approach through IDEO's method & Customer Journey Maps
3. Conduct user interviews and synthesize learnings to uncover insights and identify opportunities for innovation
4. Develop Design Driven Innovative Solutions to Real World Problems

FURTHER READING:

1. Design for Social Impact : How to by IDEO.org
2. Design Thinking Tool Kit by IDEO.org
3. The Field guide to Human Centered Design by IDEO.org

REFERENCES:

1. Creative Confidence: Unleashing the Creative Potential Within Us All Book by David M. Kelley and Tom Kelley, 2013
2. Change by Design: How Design Thinking Transforms Organizations and Inspires InnovationBook by Tim Brown, 2009
3. The art of Innovation by Tom Kelly, 2011

4. Design Thinking for Strategic Innovation: What They Can't Teach You at Business Or Design SchoolBook by Idris Mootee, 2013
5. The Design of Everyday Things Book by Don Norman, 1988
6. The Design Thinking Playbook: MindfulDigital Transformation of Teams, Products, Services, Businesses and EcosystemsBook by Michael Lewrick, 2017

Assessment Procedure:-

1. Quiz [3] 10 Marks Each – 5%
2. Class Participation – 5%
3. Assignment [Case Study based]– 10%
4. Poster Presentation – My Game Changer – 5%
5. Written Test [50 marks] – 20%
6. Design Project
    1. Mid Term Presentation1 – 15%
    2. Mid Term Presentation2 – 15%
    3. Final Presentation – 25%

1901MGX07	UNIVERSAL HUMAN VALUES & ETHICS	L	T	P	C
		3	0	0	3

Course Objectives:

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Unit I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	9 Hours

Understanding the need, basic guidelines, content and process for Value Education - Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations - Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority - Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario - Method to fulfill the above human aspirations: understanding and living in harmony at various levels

Unit II	Understanding Harmony in the Human Being - Harmony in Myself	9 Hours

Understanding human being as a co-existence of the sentient 'I' and the material 'Body' - Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha - Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' - Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail - Programs to ensure Sanyam and Swasthya

Unit III	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	10 Hours

Understanding harmony in the Family- the basic unit of human interaction - Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship - Understanding the meaning of *Vishwas*; Difference between intention and competence - Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship

Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals - Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!

Unit IV	Understanding Harmony in the Nature and Existence - Whole existence as Co-existence	9 Hours

Understanding the harmony in the Nature - Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature - Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space - Holistic perception of harmony at all levels of existence

Unit V	Implications of the above Holistic Understanding of Harmony on Professional Ethics	8 Hours
Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, - b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers - b) At the level of society: as mutually enriching institutions and organizations		
	Total:	**45 Hours**

Further Proceeding:	
	1. Analysis about Code of Conduct for Ethical & Moral values

Course Outcomes:	
	After completion of the course, Student will be able to
	1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
	2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
	3. Understand the value of harmonious relationship based on trust and respect in their life and profession
	4. Understand the role of a human being in ensuring harmony in society and nature.
	5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

References:

1. A Nagraj, 1998, JeevanVidyaEkParichay, Divya Path Sansthan, Amarkantak.
2. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3. A N Tripathy, 2003, Human Values, New Age International Publishers.
4. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA

1904GE751	LIFE SKILLS - COMPREHENSIVE VIVA	L	T	P	C
		2	0	0	2

Course Objectives

The students should be made to:

1. Study the concepts of concrete structures, design and analysis.
2. Study the process and implementation of surveying, geotechnical engineering.
3. Familiar with the construction materials, management and waste water engineering

Total: 30 Periods

BUILDING MATERIALS: brick, stones, aggregates, cement, Timber

CONSTRUCTION PRACTICES: Construction of stone masonry, brick masonry and R.C.C. and block masonry– construction equipments.

ENGINEERING SURVEY: Survey - computation of areas - Chain Survey - Compass surveying - Plane table survey – leveling

STRENGTH OF MATERIALS: Stresses and strains -Thermal stresses- elastic constants - Beams and bending – Bending moment and shear force in beams

STRUCTURAL ANALYSIS: Indeterminate beams - Stiffness and flexibility methods of structural analysis – Slope deflection - Moment Distribution method – Arches and suspension cables

GEOTECHNICAL ENGINEERING: Formation of soils - types of soils - classification of soils for engineering practice – Field identification of soils - Physical properties of soils - Three phase diagram- Soil exploration - Soil sampling techniques -Borelog profile - shallow foundations

ENVIRONMENTAL ENGINEERING: Sources of water - Ground water Hydraulics - Characteristics of water - Water analysis -water treatment - water borne diseases. Sewerage system

DESIGN OF REINFORCED CONCRETE: Design of concrete members - limit state and working stress design concepts - design of slabs - one way, two way and flat slabs.

HYDRAULICS: Hydrostatics-applications of Bernoulli equation – flow measurement in channels, Applications of Momentum equation, Kinematics of flow.

TRANSPORTATION ENGINEERING: Different modes of transport and their characteristics. Geometric design of highways –Design and Construction of bituminous and concrete roads - Maintenance of roads.

1902CE751 IN-PLANT TRAINING / INTERNSHIP PRESENTATION

L	T	P	C
0	0	2	1

In order to provide the experiential learning to the students, the students undergo in-plant training or internship during summer / winter vacation between III and VII semesters. A presentation based on in-plant training / internship shall be made in this semester and suitable credit may be awarded.

Internal Assessment Only	
Test	40
Presentation / Quiz / Group Discussion	40
Report	20
Grades (Excellent / Good / Satisfactory / Not Satisfactory)	