**E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**COURSE PLAN**

**COURSE CODE : CE6601 COURSE NAME :** **DESIGN OF RC AND BM STRUCTURES**

**SEMESTER : VI SEM. CIVIL. ENGG. – A&B SECTION ACADEMIC YEAR: 2016-2017**

**COURSE DURATION: JANUARY – MAY 2017 CLASS ROOM : PG206**

**FACULTY DETAILS: Dr. R. Sivakumar, Prof/Civil Engg.**

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| **PURPOSE** | To impart design knowledge of continuous beams, slabs, staircases, walls and brick masonry structures and to introduce yield line theory. |
| **PREREQUISITE** | Design of Reinforced Concrete elements |
| **INSTRUCTIONAL OBJECTIVES** | 1. To impart design knowledge of Retaining walls 2. To impart the design knowledge of rectangular and circular water tanks both below and above ground level, Design of circular slab 3. To impart the design knowledge of staircases, flat slabs, mat foundation, box culvert and road bridges 4. To impart the design knowledge of square, rectangular, circular, and triangular slabs 5. To impart the design knowledge of Brick Masonry |
| **INSTRUCTIONAL OUTCOME** | After completion of this course, students can able to   1. Apply these design principles with confidence in field application to design of Dams, , Compound walls and Bridge Abutments for the society. 2. Identify the practical difficulties and apply these design principles to design of water tanks, Swimming pool with confidence in field applications. 3. Apply these design principles in designing staircase, flat slabs, bridge decks and foundations for any ordinary and innovative building designs. 4. Analyse any type of slabs in any given structures 5. Analyse and Design any type of brick masonry structure. |

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| Course designed by | | Anna University, Chennai(R-2013) | | | | | |
| 1 | Category | | GENERAL  (G) | BASIC SCIENCES  (B) | | ENGINEERING SCIENCES  AND TECHNICAL ART  (E) | **PROFESSIONAL**  **SUBJECTS**  **(P)** |
|  |  | |  | **x** |
| 2 | Broad area | | **Theory** | | Planning&Design | Estimation | **General** |
|  | | **x** |  |  |
| 3 | Course co-coordinator | | | | | Dr. R.Sivakumar | |

**Direct assessment details**

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| **Name of assessment** | **Internal Marks** | **Topics** | **Duration** |
| Unit Test | 20 | Unit I | 2 periods |
| Daily Test 1 | Unit II | 1 period |
| Daily Test 2 | Unit III | 1 period |
| Daily Test 3 | Unit IV | 1 period |
| Cycle Test -1 | II & III Units | 3 Hrs |
| Cycle Test -2 | IV & V Units | 3 Hrs |
| Model Exam | Entire Syllabus | 3 Hrs |
| Assignments |  | Entire Syllabus |  |
| Innovative Assignment | Content Beyond Syllabus |  |
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| Total | 20 |  |  |

**DETAILED LESSON PLAN**

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| **UNIT I: RETAINING WALLS**   |  |  |  | | --- | --- | --- | | **LECTURE** | **TUTORIAL** | **PRACTICAL** | | **9 Hrs.** | **0 Hr.** | **0 Hr.** |   Design of Cantilever and Counterfort Retaining walls | | | | | | | |
| **Session No** | **Topics to be covered** | **Instruction Delivery** | | | **Testing Method** | **Instructional objective** | **Course Outcome** |
| **Method** | **Teaching Aids** | **Level** |
| 1,2 | Introduction, Types of retaining walls, Design procedure | Lecture with discussion | PPT,  BB & Chalk | Understand | Tests,  Assignments | To impart design knowledge of Retaining walls | The student will be able to apply these design principles with confidence in field application to design Dams, Swimming pool, Compound walls and Bridge Abutments for the society. |
| 3 | Over view on Gravity Retaining wall, Buttress wall |
| 4, 5, 6 | Design of Cantilever retaining walls |
| 7, 8, 9 | Design of Counter fort retaining walls |
| **CUMULATIVE HOURS = LECTURE - 09, TUTORIAL - 0** | | | | | | | |

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| **UNIT II: WATER TANKS**   |  |  |  | | --- | --- | --- | | **LECTURE** | **TUTORIAL** | **PRACTICAL** | | **9 Hrs.** | **0 Hr.** | **0 Hr.** |   Design of rectangular and circular water tanks both below and above ground level - Design of circular slab. | | | | | | | |
| **Session No** | **Topics to be covered** | **Instruction Delivery** | | | **Testing Method** | **Instructional objective** | **Course Outcome** |
| **Method** | **Teaching Aids** | **Level** |
| 10, 11 | Design of rectangular water tanks below ground level | Lecture with discussion& case studies | PPT,  BB & Chalk | Apply | Tests,  Assignments | To impart the design knowledge of rectangular and circular water tanks both below and above ground level, Design of circular slab | The student will be able to identify the practical difficulties and apply these design principles with confidence in field applications. |
| 12, 13 | Design of rectangular water tanks above ground level |
| 14 | Design of circular water tanks below ground level |
| 15, 16 | Design of circular water tanks above ground level |
| 17 | Case studies in constructing below ground and above water tanks with discussion on practical difficulties |
| 18 | Design of circular slab |
| **CUMULATIVE HOURS = LECTURE - 18, TUTORIAL - 0** | | | | | | | |

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| **UNIT III: SELECTED TOPICS**   |  |  |  | | --- | --- | --- | | **LECTURE** | **TUTORIAL** | **PRACTICAL** | | **9 Hrs.** | **0 Hr.** | **0 Hr.** |   Design of staircases (ordinary and doglegged) – Design of flat slabs – Principles of design of mat foundation, box culvert and road bridges | | | | | | | |
| **Session No** | **Topics to be covered** | **Instruction Delivery** | | | **Testing Method** | **Instructional objective** | **Course Outcome** |
| **Method** | **Teaching Aids** | **Level** |
| 19, 20 | Design of staircases (ordinary and dog legged) | Lecture with discussion& case studies | PPT,  BB & Chalk | Apply | Tests,  Assignments | To impart the design knowledge of staircases, flat slabs, mat foundation, box culvert and road bridges | The student will be able to apply these design principles in designing staircase, flat slabs, bridge decks and foundations for any ordinary and innovative building designs. |
| 21, 22 | Design of flat slabs |
| 23, 24 | Principles of design of mat foundation |
| 25 | Discussion on IS codal provisions in design and construction of staircase, flat slabs, bridges and foundations – IS 2911, IRC 112, IS 456, NBC. |
| 26, 27 | Principles of design of box culvert and road bridges |
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| **CUMULATIVE HOURS = LECTURE - 27, TUTORIAL - 0** | | | | | | | |

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| **UNIT IV: YIELD LINE THEORY**   |  |  |  | | --- | --- | --- | | **LECTURE** | **TUTORIAL** | **PRACTICAL** | | **9 Hrs.** | **0 Hr.** | **0 Hr.** |   Assumptions - Characteristics of yield line - Determination of collapse load / plastic moment - Application of virtual work method - square, rectangular, circular and triangular slabs - Design problems | | | | | | | |
| **Session No** | **Topics to be covered** | **Instruction Delivery** | | | **Testing Method** | **Instructional objective** | **Course Outcome** |
| **Method** | **Teaching Aids** | **Level** |
| 28, 29 | Assumptions - Characteristics of yield line | Lecture with discussion,  case studies,  model creation. | PPT,  BB & Chalk | analyze | Tests,  Assignments | To impart the design knowledge of square, rectangular, circular, and triangular slabs | The student will able to Analyse any type of slabs in any given structures |
| 30, 31 | Determination of collapse load / plastic moment - Application of virtual work method |
| 32 | Design of square slabs |
| 33 | Design of rectangular slabs |
| 34 | Design of circular |
| 35 | Design of triangular slabs |
| 36 | Application of yield line theory in software packages |  |  |  |  |  |  |
| **CUMULATIVE HOURS = LECTURE - 36, TUTORIAL - 0** | | | | | | | |

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| **UNIT V: BRICK MASONRY**   |  |  |  | | --- | --- | --- | | **LECTURE** | **TUTORIAL** | **PRACTICAL** | | **9 Hrs.** | **0 Hr.** | **0 Hr.** |   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 | | | | | | | |
| **Session No** | **Topics to be covered** | **Instruction Delivery** | | | **Testing Method** | **Instructional objective** | **Course Outcome** |
| **Method** | **Teaching Aids** | **Level** |
| 37, 38 | Introduction , classification of walls , Lateral supports and stability , effective height of wall and columns | Lecture with discussion | PPT,  BB & Chalk | Application | Tests,  Assignments | To impart the design knowledge of Brick Masonry | The student will able to Analyse and Design any type of brick masonry structure. |
| 39, 40, 41 | Effective length of walls , design load , load dispersion , permissible stresses |
| 42 | Application of Brick Masonry in Arch Bridge Constructions |
| 43, 44, 45 | Design of axially and eccentrically loaded brick walls. |
| **CUMULATIVE HOURS = LECTURE - 45, TUTORIAL - 0** | | | | | | | |

**Text / Reference Books**

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| **Sl. No.** | **Title of the Book** | **Author(s)** | **Publisher** |
| **TEXT BOOKS** | | | |
| T1 | Design of Reinforced Concrete Structures | Krishna Raju.N | CBS Publishers & Distributors, New Delhi,2003 |
| T2 | Design of Reinforced Concrete Structures | Gambhir.M.L | Prentice Hall of India Private Limited, 2012. |
| T3 | Brick and Reinforced Brick Structures | Dayaratnam, P. | Oxford & IBH Publishing House, 1997 |
| **REFERENCES** | | | |
| R1 | Reinforced Concrete | Mallick, D.K. and Gupta A.P., | Oxford and IBH Publishing Company,1997 |
| R2 | Reinforced Concrete Structures | Syal, I.C. and Goel, A.K., | “A.H. Wheelers & Co. Pvt. Ltd., 1998 |
| **REFERENCE WEBSITES** | | | |
| 1 | <http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/drcbms%20Proc%20II/> | | |
| 3 | <http://www.ce.iitb.ac.in/~sub/CE338/non_trad.pdf> | | |
| 4 | www.civilconstruction.com | | |

**GAP ANALYSIS:**

To satisfy the Course Objective number 1 (To impart design knowledge of Retaining walls)

& Course Outcome number (1) (Apply these design principles with confidence in field application to design Dams, Swimming pool, Compound walls and Bridge Abutments for the society), content beyond syllabi to be exposed to the student through value added courses on design software packages.

**CONTENT BEYOND SYLLUBI**:

1. ETABS.
2. STAAD.Pro.
3. BBS

**COURSE INCHARGE**

**Programme Name: B.E. Civil Engineering**

**Programme Educational Objectives (PEOs):**

PEO1: Graduates will actively engage in problem solving using engineering principles to address the evolving needs of the society.

PEO2: Graduates will have successful career in civil engineering practice and research activities.

PEO3: Graduates will serve the society with professional ethics and integrity.

**Programme Outcomes (POs): Graduates will be able to**

**(PO1)** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**(PO2)** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**(PO3**) Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**(PO4)** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**(PO5)** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**(PO6)** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**(PO7)** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**(PO8)** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**(PO9)** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**(PO10)** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**(PO11)** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**(PO12)** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

**Programme Specific Outcomes (PSOs): Graduates will able to**

PSO1: Graduates will be able to apply appropriate methodology for geotechnical, structural design and analysis, material selection, planning, scheduling estimation and costing, using modern tool in construction field

PSO2: Graduates will be able to service to the development of public health and environmental safety of the society with ethical values.

PSO3: Graduates will be able to pursue lifelong learning and professional development to face challenging and emerging needs of the society.

**Mapping Table: COs of CE6601:DESIGN OF RC AND BM STRUCTURES Vs POs & PSOs**

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| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | |
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 2 | 2 | 2 | 1 |  |  |  | 2 |  |  |  |  |
| CO2 | 2 | 2 | 2 | 1 |  |  |  | 2 |  |  |  |  |
| CO3 | 3 | 2 | 2 | 1 |  |  |  | 2 |  |  |  |  |
| CO4 | 3 | 2 | 2 | 1 |  |  |  | 1 |  |  |  |  |
| CO5 | 3 | 3 | 3 | 2 |  |  |  | 3 |  |  |  |  |

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| Course Outcomes (COs) | Program Specific Outcomes (PSOs) | | | |
| PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 |  |
| CO2 | 3 | 2 |  |
| CO3 | 3 | 2 |  |
| CO4 | 3 | 1 |  |
| CO5 | 3 | 2 |  |

**Note:Adequate Support by the COs to Pos and PSOs: 3- High 2- Medium 1- Low**