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

**DEPARTMENT OF CIVIL ENGINEERING**

**COURSE PLAN**

**COURSE CODE : CE6604 COURSE NAME : RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING**

**SEMESTER : VI SEM.CIVIL “B” ACADEMIC YEAR: 2016-2017**

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

**FACULTY DETAILS: Mr. M.ANBARASAN, Asst. Prof/ Civil Engineering**

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| **PURPOSE** | To impart Knowledge about Railway, Airport and Harbour Engineering |
| **PREREQUISITE** | Transportation Engineering |
| **INSTRUCTIONAL OBJECTIVES** | 1. To Develop and understanding of Railway planning and track construction. 2. To impart the skills on airport planning and design. 3. To develop and understanding of harbor planning and coastal structures construction. |
| **COURSE OUTCOME** | After completion of this course, students can able to   1. Demonstrate the basic materials which are used in the railway track and its properties. 2. Illustrate the basic procedure of railway construction and its maintenance. 3. Explain the planning of airport and its components in layout. 4. Interpret the airport design and understood the basic needs in the airport construction. 5. Explain the planning & design of harbor and other costal structures. |

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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 | | | | | | Mr.M.ANBARASAN | |

**Direct assessment details**

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| **Name of assessment** | **Internal Marks** | **Topics** | **Duration** |
| Unit Test | 20 | Unit I | 2periods |
| 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 | 3Hrs |
| Model Exam | Entire Syllabus | 3 Hrs |
| Assignments |  | Entire Syllabus |  |
| Innovative Assignment | Content Beyond Syllabus |  |
|  |  |  |  |
| Total | 20 |  |  |

**DETAILED LESSON PLAN**

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| **UNIT I : RAILWAY PLANNING**   |  |  |  | | --- | --- | --- | | **LECTURE** | **TUTORIAL** | **PRACTICAL** | | **10 Hrs.** | **0Hr** | **0 Hr** |   Significance of Road, Rail, Air and Water transports - Coordination of all modes to achieve sustainability - Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods- - Soil suitability analysis - Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings. | | | | | | | |
| **Session No** | **Topics to be covered** | **Instruction Delivery** | | | **Testing Method** | **Instructional objective** | **Course Outcome** |
| **Method** | **Teaching Aids** | **Level** |
| **1** | Significance of Road, Rail, Air and Water transports | Lecture with discussion | PPT & Videos | Understand | Tests, Assignments | To Develop and understanding of Railway planning and track construction. | CO1: Upon completion of this course, the students will be able to Demonstrate the basic materials which are used in the railway track and its properties. |
| **2** | Coordination of all modes to achieve sustainability, rails |
| **3** | Elements of permanent way – Rails, Sleepers, Ballast, |
| **4** | Rrail fixtures and fastenings, - Track Stress, |
| **5** | coning of wheels, creep in rails, defects in rails |
| **6** | Route alignment surveys, conventional methods |
| **7** | Route alignment surveys, modern methods |
| **8** | Soil suitability analysis - Geometric design of railways, gradient, |
| **9** | super elevation, widening of gauge on curves |
| **10** | Points and Crossings |
| **CUMULATIVE HOURS = LECTURE - 10, TUTORIAL - 0** | | | | | | | |

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| **UNIT II:RAILWAY CONSTRUCTION AND MAINTENANCE**   |  |  |  | | --- | --- | --- | | **LECTURE** | **TUTORIAL** | **PRACTICAL** | | **9 Hrs.** | **0 Hr.** | **0 Hr.** |   Earthwork – Stabilization of track on poor soil –- Tunneling Methods, drainage and ventilation –- Calculation of Materials required for track laying - Construction and maintenance of tracks –Modern methods of construction & maintenance - Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways | | | | | | | |
| **Session No** | **Topics to be covered** | **Instruction Delivery** | | | **Testing Method** | **Instructional objective** | **Course Outcome** |
| **Method** | **Teaching Aids** | **Level** |
| **1** | Earthwork – Stabilization of track on poor soil | Lecture with discussion | PPT & Videos | Understand | Tests,  Assignments | To Develop and understanding of Railway planning and track construction. | CO2: Upon completion of this course, the student will be able to Illustrate the basic procedure of railway construction and its maintenance |
| **2** | Tunneling Methods, drainage and ventilation |
| **3** | Calculation of Materials required for track laying |
| **4** | Construction and maintenance of tracks |
| **5** | Modern methods of construction & maintenance |
| **6** | Railway stations |
| **7** | Railway stations and yards and passenger amenities- |
| **8** | Urban rail – Infrastructure for Metro railways. |
| 9 | Mono and underground railways. |
| **CUMULATIVE HOURS = LECTURE - 19, TUTORIAL – 0** | | | | | | | |

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| **UNIT III:AIRPORT PLANNING**   |  |  |  | | --- | --- | --- | | **LECTURE** | **TUTORIAL** | **PRACTICAL** | | **8 Hrs.** | **0 Hr.** | **0 Hr.** |   Air transport characteristics-airport classification-air port planning: objectives, components, layout characteristics, socio-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations, Typical airport layouts, Case studies, Parking and circulation area. | | | | | | | |
| **Session No** | **Topics to be covered** | **Instruction Delivery** | | | **Testing Method** | **Instructional objective** | **Course Outcome** |
| **Method** | **Teaching Aids** | **Level** |
| **1** | Air transport characteristics | Lecture with discussion | PPT & Videos | Understand | Tests,  Assignments | To impart the skills on airport planning and design. | CO3: Upon completion of this course, the student will be able to Explain the planning of airport and its components in layout. |
| **2** | airport classification |
| **3** | air port planning: objectives, components |
| **4** | air port planning: layout characteristics, |
| **5** | socio-economic characteristics of the Catchment area, |
| **6** | criteria for airport site selection and ICAO stipulations |
| **7** | Typical airport layouts, Case studies |
| 8 | Parking and circulation area. |
| **CUMULATIVE HOURS = LECTURE - 27, TUTORIAL – 0** | | | | | | | |

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| **UNIT IV:AIRPORT DESIGN**   |  |  |  | | --- | --- | --- | | **LECTURE** | **TUTORIAL** | **PRACTICAL** | | **08 Hrs.** | **0 Hr.** | **0 Hr.** |   Runway Design: Orientation, Wind Rose Diagram - Runway length - Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings and lighting. | | | | | | | |
| **Session No** | **Topics to be covered** | **Instruction Delivery** | | | **Testing Method** | **Instructional objective** | **Course Outcome** |
| **Method** | **Teaching Aids** | **Level** |
| **1** | Runway Design: Orientation, Wind Rose Diagram | Lecture with discussion | PPT & Videos | Understand | Tests,  Assignments | To impart the skills on airport planning and design. | CO4: Upon completion of this course, the student will be able to Interpret the airport design and understood the basic needs in the airport construction |
| **2** | Runway length - Problems on basic and Actual Length, |
| **3** | Geometric design of runways, |
| 4 | Configuration and Pavement Design Principles |
| 5 | Elements of Taxiway Design – |
| **6** | Airport Zones – Passenger Facilities and Services |
| **7** | Runway and Taxiway Markings. |
| 8 | Runway and Taxiway lighting. |
| **CUMULATIVE HOURS = LECTURE - 35, TUTORIAL – 0** | | | | | | | |

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| **UNIT V: HARBOUR ENGINEERING**   |  |  |  | | --- | --- | --- | | **LECTURE** | **TUTORIAL** | **PRACTICAL** | | **10 Hrs.** | **0 Hr.** | **0 Hr.** |   Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Environmental concern of Port Operations – Coastal Regulation Zone, 2011. | | | | | | | |
| **Session No** | **Topics to be covered** | **Instruction Delivery** | | | **Testing Method** | **Instructional objective** | **Course Outcome** |
| **Method** | **Teaching Aids** | **Level** |
| **1** | Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides | Lecture with discussion,  and practice in Industrial visit | PPT & Videos | Understand | Tests,  Assignments | To develop and understanding of harbor planning and coastal structures construction. | CO5: Upon completion of this course, the student will be able to Explain the planning & design of harbor and other costal structures. |
| **2** | Planning and Design of Harbours: Requirements, Classification |
| **3** | Location and Design Principles |
| 4 | Harbour Layout and Terminal Facilities |
| **5** | Terminal Facilities ,Coastal Structures: Piers, Break waters, |
| **6** | Wharves, Jetties, Quays, Spring Fenders, |
| 7 | Dolphins and Floating Landing Stage |
| 8 | Inland Water Transport, Wave action on Coastal Structures |  |  |
| 9 | Wave action on Coastal Structures and Coastal Protection Works |
| 10 | Environmental concern of Port Operations – Coastal Regulation Zone, 2011. |
| **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 | A Course in Railway Engineering | SaxenaSubhash C and SatyapalArora | DhanpatRai and Sons, Delhi, 2003 |
| T2 | Railway Engineering | Satish Chandra and Agarwal M.M | Oxford University Press, New Delhi, 2013. |
| T3 | Airport Planning and Design | Khanna S K, Arora M G and Jain S S, | Nemchand and Brothers, Roorkee, 2012. |
| T4 | A Course in Docks and Harbour Engineering | Bindra S P | DhanpatRai and Sons, New Delhi, 2013 |
| **REFERENCES** | | | |
| R1 | Railway Engineering | Rangwala | Charotar Publishing House, 2013 |
| R2 | Airport Engineering | Rangwala | Charotar Publishing House, 2013 |
| R3 | Harbor Engineering | Rangwala | Charotar Publishing House, 2013 |
| R4 | A course in Docks &Harbour Engineering | Oza.H.P. andOza.G.H | Charotar Publishing House, 2013 |
| R5 | A course in Railway Track Engineering | Mundrey J.S | Tata McGraw Hill, 2007. |
| R6 | Dock and Tunnel Engineering | Srinivasan R | Tata McGraw Hill, 2007. |
| **REFERENCE WEBSITES** | | | |
| 1 | www.wikipedia.com | | |
| 2 | www.NPTEL.com | | |

**GAP ANALYSIS:**

To satisfy the

Course Outcome number 2 (Illustrate the basic procedure of railway construction and its maintenance)

Course Outcome number 4 (Interpret the airport design and understood the basic needs in the airport construction)

&

Course Outcome number (5) (Explain the planning & design of harbor and other costal structures),

Content beyond syllabi to be exposed to the student through the field visit.

**CONTENT BEYOND SYLLUBI:** Field visit for the following places:

1. Nagapattinam Railway Junction.
2. Karaikal Port
3. Trichy Airport

**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**

1. 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.

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

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

**Mapping Table: COs of CE6604: Railways, Airports, Harbour Engineering 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 |
| CO LEVEL | K3 | K4 | K5 | K5 |  |  |  |  |  |  |  |  |
| CO1 | K2 | 2 | 1 | - | - |  |  |  |  |  |  |  |  |
| CO2 | K2 | 2 | 1 | - | - |  |  |  |  |  |  |  |  |
| CO3 | K2 | 2 | 1 | - | - |  |  |  |  |  |  |  |  |
| CO4 | K2 | 2 | 1 | - | - |  |  |  |  |  |  |  |  |
| CO5 | K2 | 2 | 1 | - | - |  |  |  |  |  |  |  |  |

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| Course Outcomes (COs) |  | PSO1 | PSO2 | PSO3 |
| CO LEVEL | K3 | K4 | K4 |
| CO1 | K2 | 2 | - | - |
| CO2 | K2 | 2 | - | - |
| CO3 | K2 | 2 | - | - |
| CO4 | K2 | 2 | - | - |
| CO5 | K2 | 2 | - | - |

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