

**SECOND SEMESTER 2021-2022**

# Course Handout Part II

Date: 15-01-2022

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

*Course No.* : CE F416

## Course Title : Computer Applications in Civil Engineering

## Instructor-in-Charge : Dr. Arkamitra Kar

**Scope and Objective of the Course:**

* Introduction to matrix methods of structural analysis.
* Introduction on how to use the commercially available software, relevant to civil engineering structures
* Emphasis on MS-Excel, STAAD Pro V8i, RISA-2D, R.
* Analysis and design of reinforced concrete beams, slabs, columns, and foundations using software

packages mentioned above.

**Expected Course Outcome:**

After attending this course, the student will develop an ability to:

* Apply the basics of matrix method of analysis of structures
* Analyze and design civil structural elements using commercial software packages, according to the guidelines of Indian Standard Codes of Practice
* Apply knowledge of software commonly found in practice – STAAD Pro, RISA, MS Excel.
* Apply these acquired skills for providing solutions to real-life civil engineering structures.

Student Learning Outcomes (SLOs) assessed in this course – **(a), (b), (j),** and **(k).**

**Textbooks:**

1. Amin Ghali, Adam Neville, and Tom G. Brown, “Structural Analysis: A Unified Classical and Matrix Approach”, 2009, 6th Ed., CRC Press.

**Reference books**

1. IS 456:2000 “Code of practice for Plain and Reinforced concrete”, Bureau of Indian Standards, New Delhi.
2. Special Publication (SP)-16, Design aids for reinforced concrete to IS 456:1978, Bureau of Indian Standards, New Delhi.
3. IS 875 – Part III (2015) “Code of practice for Design Loads (Other than Earthquake) for Buildings and Structures Part 3 Wind Loads”, Bureau of Indian Standards, New Delhi.
4. IS 1893 – Part 1 (2016) “Criteria for Earthquake Resistant Design of Structures”, Bureau of Indian Standards, New Delhi.

**Course Plan:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lecture No.** | **Topics Covered** | **Learning Outcomes** | **Chapter in the Text Book** | **SLO** |
| 1-2 | Objectives & Methods  of Analysis & Design | Study the objectives and methods of RC Design; Compute Loads & Forces acting on structures. | 1,2 | (a) |
| 3-4 | Matrix method of structural analysis | Study static and kinematic indeterminacies; Analyze structures using flexibility & stiffness methods | 4,5 | (a) |
| 5 | Introduction to civil engineering software | Study the documentation for software used in civil engineering applications, with emphasis on structural engineering; Study their application to existing practical problems | 22 | (a), (j) |
| 6 - 16 | Application of MS-Excel | Formulate MS-Excel programs to analyze and design structural elements | MS-Office | (b), (k) |
| 17 - 18 | Application of RISA | Analyze 2-D structural elements Using RISA | Software Documentation | (b) |
| 19 - 34 | Application of STAAD Pro | Analyze and Design beams, columns, slabs, and foundations using STAAD Pro v8i. | Software Documentation | (b), (j), (k) |
| 35-42 | Application of R | Apply R statistical package to develop prediction models | Software Documentation | (b), (j), (k) |

**Laboratory Schedule**

|  |  |  |
| --- | --- | --- |
| **Week** | **Lab Work Description** | **SLO** |
| **1** | Formulate MS-Excel programs to analyze loads on structures | (b), (j), (k) |
| **2** | Formulate MS-Excel programs to design beams and columns |
| **3** | Formulate MS-Excel programs to design foundations |
| **4** | Analyze 2-D trusses and beams Using RISA |
| **5** | Analyze and Design beams, using STAAD Pro v8i. |
| **6** | Analyze and Design beams, using STAAD Pro v8i. |
| **7** | Analyze and Design beams, using STAAD Pro v8i. |
| **8** | Analyze and Design columns using STAAD Pro v8i. |
| **9** | Analyze and Design foundations using STAAD Pro v8i. |
| **10** | Apply R statistical package to develop prediction models |
| **11** |
| **12** |

**\*Student Learning Outcomes (SLOs):**

SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

1. an ability to apply knowledge of mathematics, science and engineering
2. an ability to design and conduct experiments, as well as to analyze and interpret data
3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. an ability to function on multidisciplinary teams
5. an ability to identify, formulate, and solve engineering problems
6. an understanding of professional and ethical responsibility
7. an ability to communicate effectively
8. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. a recognition of the need for, and an ability to engage in life-long learning
10. a knowledge of contemporary issues
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**Evaluation Scheme**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Evaluation component** | **Duration** | **Weightage** | **Date, time** | **Nature of component** |
| 1. | Mid-sem Exam | 90 mins. | 30% | 12/03 9.00am to10.30am | OB |
| 2. | Project | - | 10% | - | OB |
| 3. | Lab Assignments | As per Timetable | 20% | Weekly | OB |
| 4. | Surprise Tests (5) | 15 mins | 5% | - | OB |
| 5. | Comprehensive Exam | 120 mins. | 35% | 11/05 FN | OB |

**Chamber Consultation Hour:** To be announced in the class.

**Notices:** All Notice concerning the course will be displayed through CMS and on **the Announcement Board** of the Google Classroom.

**Make up policy:** Makeup will be given only to the genuine cases with prior permission.

**Evaluation:** Curved gradation policy will be adopted; however, the student is expected to score *at least 30%* of the total marks to achieve a completed grade.

**Weekly assignments:** 20% of the total marks are going to be awarded for *weekly lab assignments*, which will be *evaluated during the laboratory classes*.

**Academic Honesty and Integrity Policy**: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Instructor-in-charge**

**CE F416**