

FUE - Future University in Egypt

**Faculty of Engineering and Technology
Department of Architectural Engineering**

Course Specifications

ARC 341: Building Construction and Materials (3)

Programme (s) on which the course is given: B.Sc. in Engineering (Architecture Engineering)

Major or minor element of programmes: (Not Applicable)

Department offering the programme: Architectural Engineering

Department offering the course: Architectural Engineering

Academic year/Level: 3rd year – 5th semester – Level Three

Date of specification approval: September 2019

A- Basic Information

Title: Building Construction and Materials (3)

Code: ARC 341

Credit Hours: 3 Cr. Hrs.

Lectures: 2 Hrs.

Tutorial: 4 Hrs.

Total: 6 Hrs.

Prerequisite: ARC 242: Building Construction and Materials (2)

B- Professional Information

1- Catalog Course Description:

The main concern and focus of this course will be about the advanced construction systems and execution methods. The course will cover the basics of designing and executing buildings with large span and high rise buildings; mainly the steel and wood trusses and frames. Also the course will comprise the design and execution details of space trusses, geodesic domes, tents, tension and shell structures.

2- Overall aims of the course:

- Develop the students' knowledge about the main types of advanced constructions with large spans and high rise structures.
- Develop the students' knowledge of the theory of transferring loads in large spans and high rise structures.
- Develop the students' knowledge of the different materials appropriate for executing large spans and high rise structures
- Train the students to draw different working details for large spans and high rise structures

3- Intended learning outcomes of course (ILOs):

3.1 Program ILOs that achieved by the course:

A01 Demonstrate knowledge and understanding of concepts and theories of basic and engineering sciences appropriate to architectural engineering.

A03 Demonstrate knowledge and understanding of Characteristics of engineering materials related to the discipline.

A08 Demonstrate knowledge and understanding of different building construction systems and execution design methods and techniques

A10 Demonstrate knowledge and understanding of site jargon, technical language and report writing styles and rules.

A20 Demonstrate knowledge and understanding of architectural physical and computer modeling, simulation, rendering and presentation techniques

A21 Demonstrate knowledge and understanding of the role of the architecture profession relative to the construction industry and the overlapping interests of organizations representing the built environment.

B07 Solve architectural problems often on the basis of limited and possibly contradicting information

B14 Explore and think of design forms in two and three dimensions engaging images of places and time with innovation and creativity.

B15 Derive different alternative solutions and assess their expected performance to reach architectural decisions.

B17 Integrate relationship of structure, building materials, and construction elements into design process.

C07 Build architectural physical and computer models.

C12 Prepare and present working drawings, and construction documents for design projects

C14 Produce professional workshop and technical drawings using traditional drawing and computer-aided drawing techniques.

C15 Use appropriate construction techniques and materials to specify and implement different designs;

D06 Manage tasks and resources

D07 Search for information and adopt life-long self-learning

D09 Refer to relevant literatures.

3.2. Course Detailed ILOs:

a- Knowledge and understanding:

By the end of this course the student should maintain an 80% of proficiency level at:

- a1. Listing the main types of advanced constructions with large spans.
- a2. Listing the main types of advanced constructions with high rise.
- a3. Illustrating how live/dead loads are transferred through different structure systems with large span.
- a4. Illustrating how live/dead loads are transferred through different structure systems with high rise.
- a5. Listing different materials appropriate for executing large spans constructions.

- a6. Listing different materials appropriate for executing high rise constructions.
- a7. Identify different ways of modelling and presenting structure systems.

b- Intellectual skills:

By the end of this course the student should maintain an 80% of proficiency level at:

- b1. Differentiating between diverse types of large span structures considering optimum covered span and resulting form.
- b2. Differentiating between diverse types of high rise structures considering resulting form and plan, also the maximum rise.
- b3. Selecting proper structural system according to the building needs and function.
- b4. Deduce the structure system that is used in a given complete project.

c- Professional and practical skills:

By the end of this course the student should maintain an 80% of proficiency level at:

- c1. Designing appropriate structure system for various constructional cases that include large span or high rise structures.
- c2. Using freehand sketches and engineering drafting to draw building construction details
- c3. Designing appropriate details for various constructional cases that include large span or high rise structures.
- c4. Build architectural physical models for different construction ways for large spans and high rise constructions.

d- General and transferable skills:

By the end of this course the student should maintain a 40% of proficiency level at:

- d1. Manage tasks and resources
- d2. Search for information
- d3. Refer to relevant literatures.

4- Course ILOs versus Program ILOs relation

See table [1]

5- ILOs Teaching & Assessment Method

See Appendix (1)

6- Course Contents:

| # | Topics | Lec. | Tut. | Total |
|-------|---|------|------|-------|
| 1 | Introduction | 2 | 4 | 6 |
| 2 | Linear structures (vector-active): steel trusses | 2 | 4 | 6 |
| 3 | Linear structures (Section-active): steel frames | 2 | 4 | 6 |
| 4 | Wooden trusses and frames | 2 | 4 | 6 |
| 5 | space structures(Surface-active): steel space trusses | 2 | 4 | 6 |
| 6 | space structures(Surface-active): Geodesic Domes | 2 | 4 | 6 |
| 7 | space structures(Form-active): Cable structures | 2 | 4 | 6 |
| 8 | space structures(Form-active): Tent structures | 2 | 4 | 6 |
| 9 | Shell structures(Form-active): Folded Roofs | 2 | 4 | 6 |
| 10 | Shell structures(Form-active): shell structures , double curvature | 2 | 4 | 6 |
| 11 | Hybrid Structures | 2 | 4 | 6 |
| 12 | High rise buildings systems (research submission & discussion) | - | 6 | 6 |
| 13 | High rise buildings systems (research submission & discussion) + sum up lecture | 2 | 4 | 6 |
| 14 | Revision | 4 | 2 | 6 |
| Total | | 28 | 56 | 84 |

7- Weighting of assessments

- Final exam:.....40%
- Year work:
 - Midterm exam.....10%
 - Self-study..... 10%
 - Assignments/Studio work.....30%
 - Participation.....10%

8- List of references:

1. Text Book:
Angel, Heino, Structural Systems, Hatje Cantz; 3 edition (February 1, 2007)
2. Handouts
3. Recommended Readings:
 - a) Ching, Francis D. K.; Building Construction Illustration, 4th Ed- 2008
 - b) Mckay's, W. B. et ell; Building Construction, v. I- 2012
 - c) Ramsey, Sleeper; Architectural graphic standards - 2016

9- Facilities required for teaching and learning:

- Design Studios
- White board
- Computer & Data show for presentations
- Internet Connection
- Architectural Library

Course coordinator: Prof. Dr.Samir Sadek
Head of Department: Prof. Dr. Samir Sadek Hosny
Date: September 2019

Appendix (1)

Table [1]: Course ILOs/ Program ILOs Matrix

| | | Program ILOs | | | | | | | | | | | | | | | | |
|--|----|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | A01 | A03 | A08 | A10 | A20 | A21 | B07 | B14 | B15 | B17 | C07 | C12 | C14 | C15 | D06 | D07 | D09 |
| Course's Intended learning outcomes (ILOs) | a1 | | | ● | ● | | ● | | | | | | | | | | | |
| | a2 | | | ● | ● | | ● | | | | | | | | | | | |
| | a3 | ● | | | | | | | | | | | | | | | | |
| | a4 | ● | | | | | | | | | | | | | | | | |
| | a5 | | ● | | | | | | | | | | | | | | | |
| | a6 | | ● | | | | | | | | | | | | | | | |
| | a7 | | | | | ● | | | | | | | | | | | | |
| | b1 | | | | | | | ● | ● | ● | | | | | | | | |
| | b2 | | | | | | | ● | ● | ● | | | | | | | | |
| | b3 | | | | | | | | | | ● | | | | | | | |
| | b4 | | | | | | | ● | | | | | | | | | | |
| | c1 | | | | | | | | | | | | ● | ● | | | | |
| | c2 | | | | | | | | | | | | ● | ● | | | | |
| | c3 | | | | | | | | | | | | | | ● | | | |
| | c4 | | | | | | | | | | | ● | | | ● | | | |
| | d1 | | | | | | | | | | | | | | | ● | | |
| | d2 | | | | | | | | | | | | | | | | ● | |
| d3 | | | | | | | | | | | | | | | | | ● | |

Table [2]: Course Content/ILO Matrix

| Topic | a1 | a2 | a3 | a4 | a5 | a6 | a7 | b1 | b2 | b3 | b4 | c1 | c2 | c3 | c4 | d1 | d2 | d3 |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Introduction | ● | ● | | | | | ● | | | | | | | | | | | ● |
| Linear structures (vector-active): steel trusses | | | ● | | ● | | | ● | | ● | ● | | | | | | | ● |
| Linear structures (Section-active): steel frames | | | ● | | ● | | | ● | | ● | ● | | | | | | | ● |
| Wooden trusses and frames | | | ● | | ● | | | ● | | ● | ● | | | | | | | ● |
| space structures(Surface-active): steel space trusses | | | ● | | ● | | | ● | | ● | ● | | | | | | | ● |
| space structures(Surface-active): Geodesic Domes | | | ● | | ● | | | ● | | ● | ● | | | | | | | ● |
| space structures(Form-active): Cable structures | | | ● | | ● | | | ● | | ● | ● | | | | | | | ● |
| space structures(Form-active): Tent structures | | | ● | | ● | | | ● | | ● | ● | | | | | | | ● |
| Shell structures(Form- | | | ● | | ● | | | ● | | ● | ● | | | | | | | ● |

| | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|--|---|---|---|---|---|---|---|---|---|---|---|
| active): Folded Roofs | | | | | | | | | | | | | | | | | | |
| Shell structures(Form-active): shell structures , double curvature | | | • | | • | | | • | | • | • | • | • | • | | | | • |
| Hybrid Structures | | | • | | • | | | • | | • | • | • | • | • | | | | • |
| High rise buildings' systems | | • | | • | | • | | • | | • | • | • | • | • | • | • | • | • |
| Revision | • | | | | | | | | • | | | | | | • | | | |

Table [3]: Learning Method/ILO Matrix

| Learning Method | a1 | a2 | a3 | a4 | a5 | a6 | a7 | b1 | b2 | b3 | b4 | c1 | c2 | c3 | c4 | d1 | d2 | d3 |
|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Interactive lecture | • | | • | | • | | • | • | | | | | • | | • | | | |
| Research (self-study) | | • | | • | | • | | | • | • | • | | • | • | • | • | • | • |
| Class Work | | | | | | | | • | | • | • | • | • | • | • | | | |

Table [4]: Assessment Method/Course ILO Matrix and Final Exam Blueprint

| Assessment | Mark | a1 | a2 | a3 | a4 | a5 | a6 | a7 | b1 | b2 | b3 | b4 | c1 | c2 | c3 | c4 | d1 | d2 | d3 |
|-------------------------------|------|--------|----|----|----|----|----|----|---------|----|----|----|---------|----|----|----|----|----|----|
| Participation | 10 | | | | | | | | | • | | • | | | | | • | • | • |
| Class Work - exercises | 30 | | | | | | | | • | • | | • | • | • | • | • | | | |
| Research & model (self-study) | 10 | | | | | | | | • | | | | • | • | • | • | • | • | • |
| Midterm Exam | 10 | • | | • | | • | | • | • | | • | • | • | | • | | | | |
| Final Examination | 40 | • | • | • | • | • | • | • | • | • | • | • | • | | • | | | | |
| Final Exam Mark Distribution | | (9-11) | | | | | | | (14-16) | | | | (14-16) | | | | 0 | | |