

METALLIC STRUCTURES

33525 - METALLIC STRUCTURES (2024-25)

General

Code: 33525

Lecturer responsible:

ORTEGA ALVAREZ, JOSE MARCOS

Credits ECTS:	6,00
Theoretical credits:	1,20
Practical credits:	1,20
Distance-base hours:	3,60

Departments involved

- **Dept:** ARCHITECTURAL CONSTRUCTIONS
Area: ARCHITECTURAL CONSTRUCTIONS
Theoretical credits: 0
Practical credits: 0
- **Dept:** CIVIL ENGINEERING
Area: CONSTRUCTION ENGINEERING
Theoretical credits: 1,2
Practical credits: 1,2
This Dept. is responsible for the course.
This Dept. is responsible for the final mark record.

Study programmes where this course is taught

- [DEGREE IN CIVIL ENGINEERING](#)
Course type: COMPULSORY (Year: 3)

Competencies and objectives

Course context for academic year 2024-25

"Steel Structures" is a compulsory subject from the fifth semester of the *Undergraduate Program in Civil Engineering*. In order to reach a satisfactory level of achievement it is recommended that the students are already proficient with the following competences:

- Analysis of geometric parameters of cross sections: baricentres, first and second moments of inertia.
- Construction materials in civil engineering, more specifically, structural steel and its properties.
- Analysis of statically determinate structures: simply supported beams, cantilevers and trusses.
- Analysis of statically indeterminate structures: continuous beams and 2D frames.
- Use of structural software for structural analysis, as well as programming with datasheets (e.g. Excel or similar).

The subject is organized in the following activities: seminars, group tutorials and computer aided sessions.

RELATION TO **SUSTAINABLE DEVELOPMENT GOALS (SDGs)**:

- **SDG 09 - Industries, innovation and infrastructure**
- **SDG 11 - Sustainable cities and communities**

DIGITALIZATION:

- Programming with Excel
- Use of BIM professional software for steel structures design

Course content (verified by ANECA in official undergraduate and Master's degrees) for academic year {0}

UA Basic Transversal Competences

- **CT10** : Capacitat d'enfrontar, projectar i resoldre problemes reals demandats per la societat en l'àmbit de l'enginyeria.
- **CT11** : Capacitat d'aprendre i aplicar, de forma autònoma i interdisciplinària, nous conceptes i mètodes.
- **CT12** : Capacitat d'assimilar i adaptar-se a l'evolució contínua de la tecnologia en l'àmbit de desenvolupament professional.
- **CT14** : Capacitat d'autocrítica necessària per a l'anàlisi i millora de la qualitat d'un projecte.
- **CT8** : Capacitat de planificar tasques i comprometre's en el compliment d'objectius i terminis.
- **CT9** : Capacitat de treball en grup.

Specific Competences (Civil Branch)

- **CE6** : Coneixement del comportament de les estructures de formigó armat, de formigó pretensat i de les estructures metàl·liques, i capacitat per a concebre, projectar, construir i mantenir aquest tipus d'estructures.

Basic Transversal Competences

- **CB3** : Que els estudiants tinguin la capacitat de reunir i interpretar dades rellevants (normalment dins de la seua àrea d'estudi) per a emetre judicis que incloguen una reflexió sobre temes rellevants d'índole social, científica o ètica.
- **CB5** : Que els estudiants hagen desenvolupat les habilitats d'aprenentatge necessàries per a emprendre estudis posteriors amb un alt grau d'autonomia.

Exclusive skill taught in this course

No data

Learning outcomes (Training objectives)

No data

Specific objectives stated by the academic staff for academic year 2024-25

- Applied knowledge of the technological properties and behaviour models of the materials and elements which are commonly used for the design and construction of steel structures.
- Competence for understanding and application of the Spanish and European standards for the design and construction of steel structures.
- Applied knowledge of the different structural analysis methods for steel structures according to the Spanish and European standards.
- Competence for projecting, designing, building and conservating steel structures of moderate complexity.

Content and bibliography

Content for academic year 2024-25

▪ **UNIT 1 - "Introduction to Steel Structures"**

Historical background. Production of structural steel. Hot rolled steel products. Technological properties of structural steel. Introduction to structural reliability and Level 1 methods. The Spanish and the European standards for steel structures. Basis of steel design.

▪ **UNIT 2 - "Structural actions"**

Structural actions: types and clasification. Calculation and combination of structural actions.

▪ **UNIT 3 - "Structural steel design"**

Structural safety. Structural analysis. Clasification of cross sections according to EN 1993-1-1. Plate buckling effect and effective cross sections according to EN 1993-1-5.

▪ **UNIT 4 - "Ultimate Limit States (I)"**

Uniaxially loaded steel elements. Buckling of columns. Design of statically determinate steel planar trusses. Steel beams subjected to pure bending. Lateral buckling. Shear induced buckling. Interaction between bending, shear and axial force. Resistance to transverse forces.

▪ **UNIT 5 - "Ultimate Limit States (II)"**

Analysis of I-beams subjected to torsion. Uniform built-up compression members.

▪ **UNIT 6 - "Serviceability Limit States"**

Analysis of vertical and horizontal deflections. Limits for vibrations of floors.

▪ **UNIT 7 - "Joints and bearings"**

Analysis and design of connections made with bolts. Analysis and design of welded connections. Types of bearings. Design of column bases.

▪ **UNIT 8 - "Additional considerations for structural steel design"**

Construction systems of steel structures. Principal and secondary elements and their function. Braced frames and non-sway frames.

Related links

No data

Estructuras de acero

Author(s): Argüelles Álvarez, Ramón

Issue: Madrid : Bellisco, 2005;

ISBN: 978-84-95279-97-2 (v.1) 978-84-96486-53-9 (v.2)

Category: Complementario

EAE : Instrucción de acero estructural : con comentarios de la Comisión Permanente de Estructuras de Acero

Author(s): España. Comisión Permanente de Estructuras de Acero

Issue: Madrid : Ministerio de Fomento, 2017;

ISBN: 978-84-498-0917-0

Category: Complementario

UNE-ENV 1993-1-1 : EUROCODIGO 3 : proyectos de estructuras de acero. parte 1-1: reglas generales y reglas para edificación

Author(s): Comité Europeo de Normalización

Issue: Madrid : AENOR, 1996;

ISBN: -

Category: Complementario

NCSE-02, norma de construcción sismorresistente : parte general y edificación (NCSE-02)

Author(s): ESPAÑA. Ministerio de Fomento

Issue: Madrid : Ministerio de Fomento, Centro de Publicaciones, 2009;

ISBN: -

Category: Complementario

Código técnico de la edificación : legislación y normas UNE

Author(s): Asociación Española de Normalización y Certificación

Issue: Madrid : AENOR, 2012;

ISBN: 978-84-8143-777-5

Category: Básico

Estructuras metálicas para edificación: adaptado al CTE

Author(s): MONTFORT LLEONART, José

Issue: Valencia : Editorial de la UPV, 2006;

ISBN: 84-8363-021-4

Category: Complementario

**CYPE 2008: cálculo de estructuras metálicas con Nuevo Metal
3D**

Author(s): Reyes Rodríguez, Antonio Manuel

Issue: Madrid : Anaya Multimedia, 2008;

ISBN: 978-84-415-2392-0

Category: Complementario

Assessment procedures and criteria 2024-25

- In order to pass the subject the final mark must be at least 5 out of 10 in the corresponding announcement.
- In the ordinary and the extraordinary announcements, if the mark obtained in the final exam is less than 3.5 out of 10, the final mark of the subject will have an upper limit of 4.5 out of 10 (Fail).
- Assessment in the ordinary announcement (C2):
 - The final mark of the subject in the ordinary announcement will be the weighted average of the marks obtained in the different assessment items.
- Assessment in the extraordinary announcements (C1 and C4):
 - The item "Continuous assessment to be carried out during the computer practical classes" will NOT be RECOVERABLE in the extraordinary announcements, so its mark in the ordinary announcement will be kept.
 - In the extraordinary announcements, the mark of the item "Continuous assessment to be carried out during the theory and group tutorial classes" will NOT be taken into account, so the final exam of the extraordinary announcements will serve as a global recovery of the final exam of the ordinary announcement and of the continuous assessment carried out in the theory and group tutorial classes.
 - According to the information explained, the final mark of the subject in the extraordinary announcements will be the weighted average of the marks obtained in the extraordinary final exam and in the continuous assessment carried out in the computer practical classes.
- During the assessment items consisting of written tests, the students may use as reference material the corresponding technical regulations and the documentation previously indicated by the professors' team of the subject. The use of a programmable scientific calculator is recommended.
- The marks obtained in previous academic years will not be kept neither in the current academic year nor in the next years.
- When grading the different evaluation items, errors in the application of basic concepts related to this subject or previous subjects will be severely penalized, as well as errors derived from the inappropriate use of units.
- The theoretical-practical works made during the subject have to be originals. If copy or plagiarism is detected, it will entail a mark of "0" in the corresponding evaluation item. Moreover, the head management of Civil Engineering Department and Polytechnic School will be informed about this incident. The reiteration in this conduct during this subject or another one will entail the notification of the committed offence to the corresponding Vice President Office, in order to hear the trial and penalise according to current legislation ("Reglamento de disciplina académica de los Centros oficiales de Enseñanza Superior y de Enseñanza Técnica dependientes del Ministerio de Educación Nacional BOE 12/10/1954").

Description	Criteria	Type	Weighting system
Continuous assessment to be carried out during the computer practical classes (Not Recoverable)	Resolution of written tests which will be proposed during the computer practical classes. Since these continuous assessment tests related to computer practical classes require complex calculations where a computer is needed, it is not feasible to perform these calculations in a final exam. Therefore, these tests will NOT be recoverable in the extraordinary announcements.	ACTIVITIES OF EVALUATION DURING THE SEMESTER	25
Continuous assessment to be carried out during the theory and group tutorial classes (Recoverable only in the extraordinary announcements)	Resolution of written tests that will be proposed during the theory and group tutorial classes. This part of the continuous assessment will be recoverable only in the final exam of the extraordinary announcements.	ACTIVITIES OF EVALUATION DURING THE SEMESTER	25
Final exam (Recoverable)	The final exam will take place on the dates established by the University of Alicante. It will consist of the resolution of cases or theoretical-practical exercises. The final exam will be recoverable in the extraordinary announcements.	FINAL TEST	50

Official exam dates for academic year 2024-25

Exam session	Date	Time	Group - Classroom(s) allocated	Comments
(C2) Periodo ordinario para asignaturas de primer semestre	14/01/2025			Teoría
(C4) Pruebas extraordinarias para asignaturas de grado y máster	26/06/2025			Teoría

Academic staff



ORTEGA ALVAREZ, JOSE MARCOS

Lecturer responsible

THEORY CLASS: Groups: 2

GROUP TUTORIALS: Groups: 4



MIRO OCA, MARINA

THEORY CLASS: Groups: 1

GROUP TUTORIALS: Groups: 2 , 3



PEREIRO BARCELO, JAVIER

COMPUTER PRACTICALS: Groups: 1 , 2 , 3

GROUP TUTORIALS: Groups: 1



VARONA MOYA, FRANCISCO DE BORJA

COMPUTER PRACTICALS: Groups: 4

Groups

THEORY CLASS

Group	Semester	Morning or afternoon session	Language	No. of enrolled students	
Gr. 1 (THEORY CLASS) : 1	1S	Morning	Spanish	32	
Gr. 2 (THEORY CLASS) : 2 ENG	1S	Morning	English	5	<ul style="list-style-type: none">▪ Allowed INTERNATIONAL MOBILITY PROGRAMME▪ Allowed DEGREE IN CIVIL ENGINEERING

COMPUTER PRACTICALS



Group	Semester	Morning or afternoon session	Language	No. of enrolled students
Gr. 1 (COMPUTER PRACTICALS) : 1	1S	Afternoon	Spanish	8
Gr. 2 (COMPUTER PRACTICALS) : 2	1S	Afternoon	Spanish	9
Gr. 3 (COMPUTER PRACTICALS) : 3	1S	Morning	Spanish	15
Gr. 4 (COMPUTER PRACTICALS) : 4 ENG	1S	Morning	English	5

GROUP TUTORIALS
















Group	Semester	Morning or afternoon session	Language	No. of enrolled students
Gr. 1 (GROUP TUTORIALS) : 1	1S	Morning	Spanish	9
Gr. 2 (GROUP TUTORIALS) : 2	1S	Morning	Spanish	9
Gr. 3 (GROUP TUTORIALS) : 3	1S	Morning	Spanish	14
Gr. 4 (GROUP TUTORIALS) : 4 ENG	1S	Morning	English	5






Timetables

THEORY CLASS

















Group	Start date	End date	Day	Start time	End time	Lecture room
1	09/09/2024	18/12/2024	MIE	09:00	11:00	A2/B22 
2	09/09/2024	20/12/2024	MIE	09:00	11:00	0015P1109 
















COMPUTER PRACTICALS

Group	Start date	End date	Day	Start time	End time	Lecture room
1	25/09/2024	25/09/2024	MIE	15:00	18:00	0016P1006 
1	23/10/2024	23/10/2024	MIE	15:00	18:00	0016P1006 
1	06/11/2024	06/11/2024	MIE	15:00	18:00	0016P1006 
1	20/11/2024	20/11/2024	MIE	15:00	18:00	0016P1006 
1	04/12/2024	04/12/2024	MIE	15:00	18:00	0016P1006 
2	02/10/2024	02/10/2024	MIE	15:00	18:00	0016P1006 
2	16/10/2024	16/10/2024	MIE	15:00	18:00	0016P1006 
2	30/10/2024	30/10/2024	MIE	15:00	18:00	0016P1006 
2	13/11/2024	13/11/2024	MIE	15:00	18:00	0016P1006 
2	27/11/2024	27/11/2024	MIE	15:00	18:00	0016P1006 
3	02/10/2024	02/10/2024	MIE	11:00	14:00	0016P1006 
3	16/10/2024	16/10/2024	MIE	11:00	14:00	0016P1006 
3	30/10/2024	30/10/2024	MIE	11:00	14:00	0016P1006 
3	13/11/2024	13/11/2024	MIE	11:00	14:00	0016P1006 
3	27/11/2024	27/11/2024	MIE	11:00	14:00	0016P1006 

Group	Start date	End date	Day	Start time	End time	Lecture room
4	25/09/2024	25/09/2024	MIE	11:00	14:00	0016P1006 
4	23/10/2024	23/10/2024	MIE	11:00	14:00	0016P1006 
4	06/11/2024	06/11/2024	MIE	11:00	14:00	0016P1006 
4	20/11/2024	20/11/2024	MIE	11:00	14:00	0016P1006 
4	04/12/2024	04/12/2024	MIE	11:00	14:00	0016P1006 

GROUP TUTORIALS

Group	Start date	End date	Day	Start time	End time	Lecture room
1	11/09/2024	11/09/2024	MIE	11:00	13:00	0015P1109 
1	25/09/2024	25/09/2024	MIE	11:00	13:00	0015P1109 
1	09/10/2024	09/10/2024	MIE	13:00	14:00	0015P1061 
1	23/10/2024	23/10/2024	MIE	11:00	13:00	0015P1109 
1	06/11/2024	06/11/2024	MIE	11:00	13:00	0015P1109 
1	20/11/2024	20/11/2024	MIE	11:00	13:00	0015P1109 
1	04/12/2024	04/12/2024	MIE	11:00	13:00	0015P1109 
1	18/12/2024	18/12/2024	MIE	11:00	13:00	0015P1109 
2	18/09/2024	18/09/2024	MIE	11:00	13:00	A2/B22 
2	02/10/2024	02/10/2024	MIE	11:00	13:00	A2/B22 
2	16/10/2024	16/10/2024	MIE	13:00	14:00	A2/B22 
2	16/10/2024	16/10/2024	MIE	11:00	13:00	A2/B22 
2	30/10/2024	30/10/2024	MIE	11:00	13:00	A2/B22 
2	13/11/2024	13/11/2024	MIE	11:00	13:00	A2/B22 
2	27/11/2024	27/11/2024	MIE	11:00	13:00	A2/B22 
2	11/12/2024	11/12/2024	MIE	11:00	13:00	A2/B22 

Group	Start date	End date	Day	Start time	End time	Lecture room
3	11/09/2024	11/09/2024	MIE	11:00	13:00	A2/B22 
3	25/09/2024	25/09/2024	MIE	11:00	13:00	A2/B22 
3	09/10/2024	09/10/2024	MIE	13:00	14:00	A2/B22 
3	23/10/2024	23/10/2024	MIE	11:00	13:00	A2/B22 
3	06/11/2024	06/11/2024	MIE	11:00	13:00	A2/B22 
3	20/11/2024	20/11/2024	MIE	11:00	13:00	A2/B22 
3	04/12/2024	04/12/2024	MIE	11:00	13:00	A2/B22 
3	18/12/2024	18/12/2024	MIE	11:00	13:00	A2/B22 
4	18/09/2024	18/09/2024	MIE	11:00	13:00	0015P1109 
4	02/10/2024	02/10/2024	MIE	11:00	13:00	0015P1109 
4	09/10/2024	09/10/2024	MIE	13:00	14:00	0015P1109 
4	16/10/2024	16/10/2024	MIE	11:00	13:00	0015P1109 
4	30/10/2024	30/10/2024	MIE	11:00	13:00	0015P1109 
4	13/11/2024	13/11/2024	MIE	11:00	13:00	0015P1109 
4	27/11/2024	27/11/2024	MIE	11:00	13:00	0015P1109 
4	11/12/2024	11/12/2024	MIE	11:00	13:00	0015P1109 