

SUPPORT GUIDE FOR INTEGRATING THE GENDER PERSPECTIVE

IN ENGINEERING AND ARCHITECTURE TEACHING PRACTICE



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THE IMPORTANCE OF INTEGRATING GENDER IN ENGINEERING AND ARCHITECTURE

The gender perspective has barely featured in engineering and architecture education and practice, despite the impact these disciplines have on everyday life and the organisation of spaces. Traditionally, these fields have been regarded as neutral from a technical point of view; however, teaching guidelines such as those drawn up by the Xarxa Vives d'Universitats have shown that such neutrality is only apparent, as designs, processes and technical decisions have, until now, been shaped by an androcentric perspective. At the same time, the institutional and academic dynamics within which these disciplines operate have contributed to the invisibility of women, both in the curricula and in the professional sphere. This situation is reflected, for example, in the **scarce presence of female role models in the curricula** or in the absence of critical analysis of how technological products and built environments affect women and men differently (Xarxa Vives d'Universitats, 2021a; 2021b; 2022a; 2022b, 2024).

In the case of more technical and industrial engineering disciplines, **many design decisions have been based on a standard male user**; for example, in the design of industrial tools, personal protective equipment or vehicles, which have failed to take bodily diversity into account (Maar et al., 2026; Janson et al., 2024). Similarly, in fields such as computer engineering, artificial intelligence and data analysis, **algorithmic biases that reproduce gender inequalities have been identified**, as highlighted by authors such as West, Whittaker and Crawford (2019) in their analysis of the risks posed by artificial intelligence when based on biased data. These biases have significant social impacts on women in areas such as employment, safety and access to services. Furthermore, the White Paper on Women in Technology (Sillero and Hernández, 2019) presents a wealth of examples of the inequalities that are perpetuated in this context: for example, it has been observed that fitness

trackers underestimate the number of steps taken whilst doing housework by up to 74 per cent. At a structural level, various obstacles are also evident, ranging from the under-representation of women in leadership positions to an increase in cases of sexual harassment.

Furthermore, in civil, energy and natural resources engineering, the absence of a gender perspective means that **no account is taken of how infrastructure and land-use management affect different sections of the population in different ways.** In this regard, the design of public transport, urban lighting or the planning of industrial areas, for example, does not always take into account specific needs relating to mobility, safety or work-life balance, which leads to inequalities in access to and use of resources (World Bank, 2021; OTLE, 2024).

In the field of architecture, this issue is equally evident in the configuration of the built environment, which likewise reflects and reproduces power relations and inequality. **Traditional urban planning has prioritised productive functionality and motorised traffic, to the detriment of everyday life, care and safety in public spaces** (World Bank, 2021). This has resulted in urban environments that are less accessible or safe for certain groups, particularly women, older people and children.

In light of this situation, there have been some significant advances in recent decades in incorporating a gender perspective into both engineering and architecture. In the field of engineering, this has mainly involved changes to the design of technological systems and the analysis of their social impacts. There has been increased attention to gender biases in artificial intelligence and algorithmic systems, as well as the incorporation of equity criteria into the development of digital technologies (Pérez-Ugena Coromina, 2024; Salamanca Castro, 2025). This approach has demonstrated the importance of designing technical systems critically from the outset, as otherwise they reproduce inequalities. That is why the integration of a gender perspective is being promoted as a structural element in engineering education, linking it to ethics, social responsibility and the Sustainable Development Goals (SDGs).

In architecture, approaches such as feminist urbanism and the design of so-called ‘caring cities’ have gained prominence; these aim for planning that takes into account the diversity of uses, bodies and experiences of all their inhabitants. Initiatives have also been launched in line with the recommendations of the United Nations New Urban Agenda, which promotes more inclusive, safe and sustainable cities (UN-Habitat, 2022; Xarxa Vives d’Universitats, 2021a).

However, despite these improvements, the current situation shows that the incorporation of a gender perspective into engineering and architecture studies remains limited and, in many cases, depends on isolated initiatives, placing these disciplines amongst the fields of knowledge with the lowest level of integration in this area. **Given that these disciplines play a direct role in shaping the physical, technological and social environment, they are key to building more equal societies,** which highlights the need to consolidate genuine mainstreaming within their curricula. To facilitate the incorporation of this content, specific strategies for the various degree programmes offered by the UJA are set out below, along with recommended reading for each one.

SPECIFIC STRATEGIES

INDUSTRIAL AND PRODUCTION ENGINEERING

- Include content that analyses how the design of machinery, tools and protective equipment has historically been based on male body types, so that students can identify the implications for health and safety at work.
- Incorporate practical examples of ergonomics that take bodily diversity into account, demonstrating how physical differences influence the use of industrial equipment.
- Develop activities or projects in which students are required to design industrial products or processes whilst taking user diversity into account.
- Introduce references to women's contributions to industrial engineering that are directly linked to the technical content of the modules.
- Encourage critical analysis of industrial work environments from a gender perspective, including aspects such as work organisation and occupational risk prevention.

COMPUTER AND TELECOMMUNICATIONS ENGINEERING

- Incorporate content that addresses gender bias in algorithms, artificial intelligence and data systems, so that students understand its impact on automated decision-making.
- Develop practical exercises in which real-world datasets are analysed to identify potential gender bias in their construction or use.

- Include software design exercises that take into account user diversity, promoting inclusive and accessible interfaces.
- Incorporate discussions on the social impact of digital technologies on different groups, paying particular attention to gender inequalities.
- Introduce examples and role models of women in the technology sector as part of the standard course content.
- Assess students' ability to identify and correct biases in technological systems as part of the learning outcomes.

CIVIL, LAND-USE AND GEOMATICS ENGINEERING

- Include content that analyses the impact of urban planning and infrastructure from a gender perspective, particularly in relation to mobility, safety and the use of public space.
- Develop practical case studies in which students are required to design urban spaces whilst taking into account the needs of different population groups.
- Incorporate the analysis of real-life examples of urban planning that integrate a gender perspective.
- Encourage reflection on how infrastructure decisions may affect women and men differently.
- Incorporate activities that address universal accessibility as a key element in spatial planning.

RESOURCE, ENERGY AND ENVIRONMENTAL ENGINEERING

- Incorporate content that analyses the relationship between gender and access to energy resources, including issues such as energy poverty.
- Develop case studies that demonstrate the differing impact of natural resource management on women and men.
- Integrate the SDG approach, particularly the link between SDG 5 and the objectives relating to energy and sustainability.
- Encourage projects in which students are required to propose energy solutions whilst taking into account their social and gender impacts.
- Introduce discussions on the role of women in environmental management and sustainability.

CHEMICAL AND MATERIALS ENGINEERING

- Include content that analyses the under-representation of women in scientific research and its implications for the development of knowledge.
- Incorporate examples of prominent female researchers in chemistry and materials science that are relevant to the course content.
- Develop laboratory practicals that take diversity into account in experimental design and in the interpretation of results.
- Encourage critical analysis of how scientific research may have overlooked significant differences based on sex or gender.

ARCHITECTURE

- Incorporate content on architectural design from a gender perspective, analysing how spaces influence people's safety, accessibility and well-being.
- Develop projects in which students are required to design inclusive spaces, taking into account the diversity of uses and needs.
- Include an analysis of the different ways in which spaces (housing, public spaces, facilities) are used according to gender.
- Introduce examples of architecture with a gender perspective within the theoretical and practical content.
- Encourage reflection on the relationship between urban design, care and social organisation.

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