

Colour: an experiential path between theory and practice

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Colour is one of the human activities with strong multidisciplinary characteristics. As we know, colour is a psycho-perceptive sensation that derives from lighting stimuli external to our brain, from the context in which we receive them, from our personal history and also from the cultural context in which we operate. In practical applications, colour is fundamental for many areas of human production. To name a few among the best known: industrial products, fashion, communication, interior and landscape design. Most of the time, professionals in these fields use different terms and different languages to refer to colour attributes. These difficulties are due to the intrinsic multidisciplinary nature of colour and to its many different possible applications and related technologies. Moreover, colours have emotional, cultural and symbolic valences and working with colour can sometimes look like a matter of personal preference. At the Italian Color Association, in collaboration with the Politecnico di Milano, in 2017 we designed and realised, with people coming from different countries, a post-graduate educational experiential path that starts from the scientific bases of physics, colorimetry and visual perception, passing through the intercultural aspects of colour, to get to design experiences in the contexts of communication, industrial production, landscape design, interior design and fashion design, which we present in this article.

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Introduction

Colour does not exist. Goethe, in the early 1800s, recounts: "*I had entered an inn towards evening, and, as a well-favored girl, with a brilliantly fair complexion, black hair, and a scarlet bodice, came into the room, I looked attentively at her as she stood before me at some distance in half shadow. As she presently afterwards turned away, I saw on the white wall, which was now before me, a black face surrounded with a bright light, while the dress of the perfectly distinct figure appeared of a beautiful sea-green.*" [1]. Goethe emphasises that colour is stimulated in the observer and does not exist in reality: the mind can produce colour even in the absence of external stimuli. But, if colour does not exist how is it possible to (1) communicate it, (2) use it, (3) measure it and (4) reproduce it? These are the fundamental questions to which the master programme: Master in Color Design and Technology tries to give an answer.

The participants

There are two aspects about the master programme that are important to underline: the first is that this course programme is unique in the world, and the second, related to the first, is that people all around the world are interested in attending it. In the first edition, students came from: Australia, Colombia, Egypt, Italy, Lebanon, to which are added those of the second edition coming from: Brazil, China, France, India, Portugal, Serbia, Syria and Turkey. This multicultural environment is enriching for the students, as it gives them the opportunity to meet and discuss with people from different countries, stimulating the exchange of thoughts and ideas. In both cases, the majority of students had backgrounds in architecture, interior design, product design and graphic design, and they were looking to specialise in the matter of colour and applying the gathered knowledge in their specific field. However, the programme has also attracted people with other backgrounds: visual artists, lighting designers and a psychophysicologist. This allowed the students to complete each other, especially during the project works, during which they were expected to work in groups.

We would like also to report that the major part of the student cohort participating in the first edition, now work in the field of colour, as employees at a company or as freelancers, and two of them held a seminar in the second edition.

As we are writing this article, students are engaged in internship in one of the master's partner companies.

The master programme organisation

The master programme started in March 2017 and is organised in three separate phases. The first phase consists of 200 hours of foundational and covers the many topics related to colour from a theoretical point of view. Thirty-two hours out of 200 are dedicated to professional empowerment with companies working in the field of colour, or other seminars: this empowerment helps the students to enter the professional sphere of activity.

The second part consists of other 200 hours, divided into five project works, to make students apply in practice what they have learned in the fundamentals. And other 400 hours are dedicated to individual or group study, also with the support of tutors.

At the end of the learning phases, students are placed in a two-month internship in one of the companies, professional study or research centres related to the master programme.

The first phase: theoretical foundations

The theoretical phase, run by Associazione Italiana Colore, is composed by four teaching modules. In these modules, the fundamentals are taught to the students: (1) colour culture, history and perception; (2) colorimetry, colour spaces and colour systems; (3) digital colour. The fourth module describes the profession of colour designer in different application fields. At the end of each module, the students are submitted to a test. Figure 1 shows students during the lessons. In the following sections, details about each teaching module are given.



Figure 1: Pictures taken during frontal lessons.

History and perception of colour

During the first module, aspects relating to the history and perception of colour are presented [2-3]. The classic colour vision theories and the first experiments by Goethe, Newton, Young, etc., are introduced, which lead up to the new theories of visual perception [4] together with the physiological mechanisms of the human eye brain system that affect colour perception as related to colour interactions and colours in context [5].

Colorimetry and colour systems

This module presents the essential technical skills that are the basis of the colour designer, whatever the application areas on which s/he chooses to specialise in the future. Although some aspects of colour psychology and interaction may be subjective, the colour of a surface or a light source has to be measured, communicated and represented in an accurate way, to be clearly identified. Starting from radiometry and photometry, the programme moves to colorimetry. Due to the trichromatic nature of human vision, a colour can be defined by a set of three numbers, therefore the different colour spaces such as XYZ, CIELAB, etc., are presented to the students [6-7].

In some application fields, colour atlases are used as an alternative way to represent and communicate colours. The main colour organising systems like Munsell, Pantone, RAL and NCS are shown and explained.

Digital colour

In this module, theoretical and practical fundamentals to manage, view and reproduce the digital colour applied to different media are provided. Nowadays, information travels through digital media. Within these media colour is represented differently, RGB for monitors and CMYK for printers for example. Moreover, the different devices (scanner, camera, monitor, printer) have intrinsic limitations in the representation of colours that must be correctly managed, in order to have the same colour on different devices [8-9].

Professional designer colour applications

The knowledge acquired in the previous modules can be applied in most professional fields and applications: marketing, visual communication, restoration of cultural heritage, photography, architecture, chemistry, product and lighting design and more. In this module, many cases studies are presented and discussed [10-14].

The empowerment

One way to show the application of colour in the world of work is to invite companies to present how they use colour and why they need colour experts. Some of the companies involved in the master programme, that will have the possibility to host an intern at the end of the lessons, are invited to present themselves, their products, projects and their use of colour.

The second phase: the project works

The second part of the master programme consists of five projects that allow students to apply the theoretical knowledge learned in the first phase. The first module is about brand communication in graphic design, the second deals with fashion design, the third focuses on interior design, the fourth is about product design and the fifth deals with the relationship between the colour in urban spaces and the meanings of the human interactions that take place within them. Students are divided in groups and have to present a final project for each module.

Colour in communication

This project focuses on the evocative and persuasive aspects of the chromatic choices to create a visual identity that makes a brand recognisable on the market. Colour is a key component to ensure the recognition and affirmation of the company.



Figure 2: Works by Xiaowei Xie inside the "Colour in communication" project work.

Colour in fashion design

This project defines how to use the colour in the world of textiles and fabrics, how to create a textile trend book, how material and tactile values influence the perception of colour, and how to balance colours with weaves and patterns.

Students are asked to analyse the main differences between organic and chemical dyes according to the different dyeing techniques and to illustrate a project of their own, in which they learn basic elements some basic elements of the dyeing process in order to decide the colour applied on the subject. Particular attention is devoted to balancing the issues of sustainability with the best possible "colour performances" in terms of brilliance, stability and production costs.

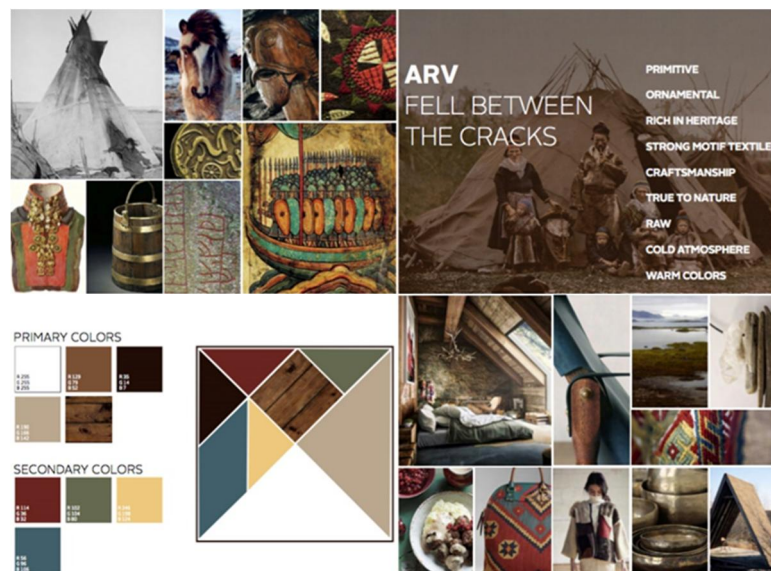


Figure 3: Works by Aja Abu El Kheir, Ashka Khandwala inside the "Colour in fashion design" project work.

Colour in interior design

This project work is dedicated to analyse the chromatic choices for the creation of innovative retail spaces, in order to have a harmonious relationship between the environment and the brand identity. Starting from practical applications, examples of different approaches to retail design are shown, and students propose both permanent and temporary commercial spaces, where the colour is a fundamental part of the experience design.

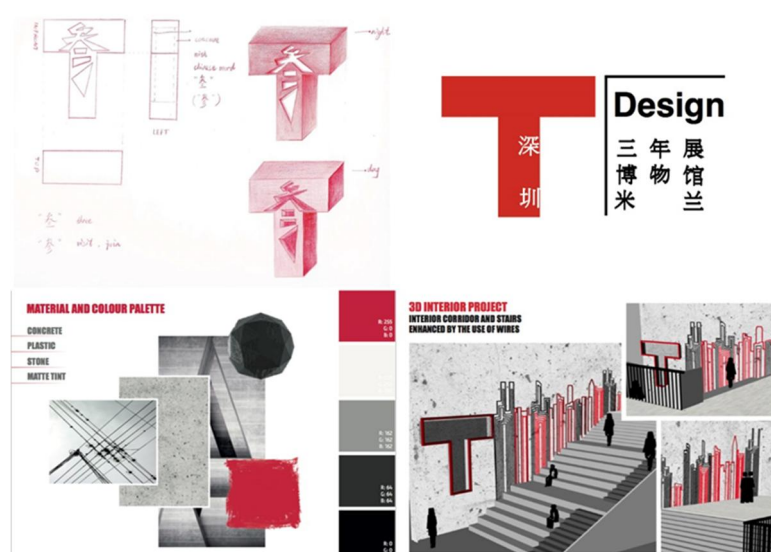


Figure 4: Works by Daniele Veronesi, Wu Ruo Xi, Xiaowei Xie, Osvaldo Perrenoud (first row) and Ashka Khandwala, Piera Leonetti, Maria Luisa Luz (second row) inside the "Colour in interior design" project work.

Colour in product design

The Aim of this project work is for students to develop a methodology to design a product through the simulation of a CMF project (Colour/Material/Finishes). The relations between shape, material and colour are investigated.

There are many phases to be considered in defining the product identity: study of the market, study of the target, study of CMF trends in the sector and creation of CMF scenarios.

The final output is realised in collaboration with a company working in the field.

**PROJECT 1
PAPER BALL FOR APPLE**

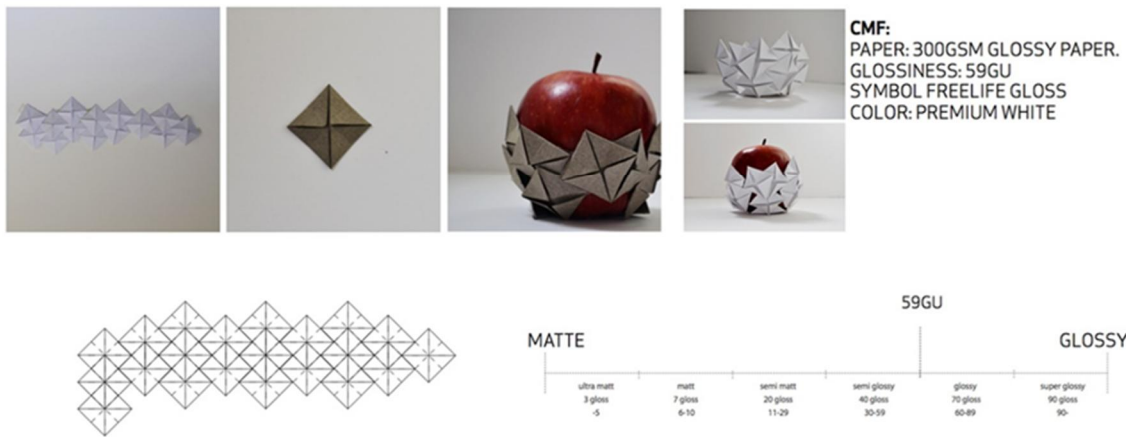


Figure 5: Works by Rawan Bakri "Colour in product design" project work.

Colour in urban space

This project addresses the relationship between the colour in urban spaces the quality and meaningful impacts in terms of human responses and relationships that take place within it. The roles of the chromatic choices and perception to improve urban identity are highlighted.



Figure 6: Works by Aja Abu Elkheir, Can Aviral, Rawan Bakri, Ashka Khandwala, Piera Leonetti, Osvaldo Perrenoud, Maria Luisa Luz, Daniele Veronesi, Wu Ruo Xi, Xiaowei Xie inside the "Colour in urban space" project work.

Conclusions

Colour is a fascinating matter. It involves different disciplines, which often speak different languages. There are scientific concepts, linked to subjects like physics, which allow us to have a correct numerical representation of colour. And there are concepts related to the human perception of colour and the impact this may have in terms of cognitive, affective and behavioural response, because the human is the final beneficiary. And here the terrain becomes slippery, because of a lack of universal colour concepts, but they vary according to the geographical areas, the culture, the historical moment, etc. The attempt of the master programme is to offer a common language, to give a view from above, so that the colour becomes a means of communication, to be used in all fields of application.

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