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Development of the first Spanish MSc in Colour Technology

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Abstract

The Department of Optics of the University of Alicante is organizing a one-year (2005-6 period) postgraduate course in colour technology with the collaboration of members of the academic staff of several Spanish universities (University of Granada, Technical University of Catalonia, Technical University of Valencia, University of Valencia, etc) and other national institutions (CSIC's Department of Metrology and Technological Institute of Optics, Colour and Imaging-AIDO). Several multinational companies have also shown their interest in collaborating. We wish this course to mark the beginning of multi-disciplinary and inter-universities national postgraduate studies, with a high degree of professional specialisation, which fulfil the guidelines of the European Higher Education Area (Bologna Process) and other European technological platforms such as Manufature or EuMaT.

Keywords

Colour Physics, Colour Vision, Colour Measurement, Colour Chemistry, Colour Formulation, Digital Colour Reproduction

Summary

1. Introduction

The purpose of colour technology is the study of the theories and techniques applied to design, manufacture and measurement of coloured objects. The industrial applications involved in the colour technology^{1,2} are numerous: textiles, paints, plastics, ceramics, graphic arts and imaging, etc. Unfortunately, Latin-American and Spanish colourists working in these industries have not received specific courses in colour science, so the fundamentals of colour science necessary for their work have been assimilated through empirical training, and the theoretical principles have been autodidactically acquired. For this reason, the Latin-American and Spanish companies associated with colour technology often invest in specialised teaching to improve the ability of their employees and at the same time to boost their wishes for professional career improvement, finally contributing also to reinforce the fidelity of the employees to their company. For this reason, the new graduates with basic training in colour science, although scarce in Latin America and Spain, are in high demand in jobs related to electronic imaging, colour instrumentation, colorant formulation, etc. However, this situation does not happen in countries like the USA³ and GB^{4,5}. Due to this social demand, which is one of the factors contemplated in the Bologna Process, and also following some actions suggested by some technology platforms

as Manufacture or EuMaT, the Department of Optics of the University of Alicante is organizing a one-year (2005-6 period) postgraduate course in colour technology with the collaboration of part of the academic staff of several Spanish universities and other national institutions. On other hand, some multinational enterprises, like Hewlett Packard, Sony, Heidelberg, Datacolor, X-Rite, Konica Minolta, GretagMacbeth, etc, have also shown their interest in collaborating.

The academic objective of this postgraduate course is to offer to graduates (physics, chemistry, engineering, computer science, designers, etc) interested in industrial colorimetry an overall perspective of this inter-disciplinary science, explaining their physical, chemical and visual laws and solving by simulation the usual problems about colour science in some industrial applications. We believe that this postgraduate course may also be interesting and useful to architects, artists and designers because, as it is justified below, issues about colour psychology, lighting, new materials and visual effects will be treated through the course.

Since the course is limited to just 200 hours, it does not include practical work in a real enterprise nor a research project dissertation. However, we hope that the course duration will be increased in future to 500 hours, i.e., a two-year postgraduate course.

In spite of this, we think this postgraduate certificate can be a great opportunity to acquire some basic skills in colour control in several industrial applications. For the experienced colourists, this postgraduate certificate can strengthen the knowledge autodidactically acquired and mean a real improvement in their professional skills, and this would benefit both the companies they work for and their own chances in the labour market. For young graduates, this postgraduate certificate gives a degree of specialisation that can improve their possibility of getting well remunerated jobs in industry.

2. Method

The programme (see Table 1) is made up from 7 modules, distributed along to 29 sessions of approximately seven hours each (four in the morning and three in the afternoon):

Table 1: Programme of the MSc in Colour Technology organised by the University of Alicante.

Module	Indicative content	Credit hour
The causes of colour		0.7
Colour Vision	Tristimulus specification, CIE standard observer and colour spaces, colour appearance, colour differences, colour atlases (Munsell, NCS, RAL, etc)	4.2
Colour Measurement	Spectrophotometers, colorimeters, densitometers	1.4
Fundamentals of Colour Reproduction	Additive, subtractive and hybrid colour mixing (halftoning, Yule-Nielsen-Neugebauer model)	1.9
Colour Chemistry	Dyes and pigments, Lambert-Beer and Kubelka-Munk laws, colour formulation	2.8
Industrial Colorimetry	Coloration and colour control in lighting, textiles, paints, plastics, paper and ceramics	4.2

Digital Reproduction	Colour	Digital imaging, colour management, colour modelling and calibration of capture, display and printing devices 4.8
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Since the native language will be Spanish, this postgraduate course is directed also to Latin America, and for this reason two editions of the course will be offered: the first one to take place all Fridays from October to June, the second one, in June and July, from Monday to Friday. In this way, we hope to facilitate the attendance of Spanish students, whatever their geographical origin, and Latin American students.

Whereas the full-time edition (from June to July) will always be at the University of Alicante, one of the organisation issues under study is the permutation of the partial-time edition (from October to June) of the postgraduate course among several Spanish universities (Barcelona, Granada, Madrid, etc). This will facilitate the attendance of more students in future academic years. Moreover, in this way the postgraduate certificate could be guaranteed simultaneously by several Spanish universities before it is granted the status of "national certificate". This is requisite for a future co-ordination with other European universities interested into the development and consolidation of the European MSc in Colour Technology or Engineering.

Concerning teaching and learning methods, we are trying to design an interesting course, and we believe that it will be useful for professionals working with colour in different industries (textiles, paints, plastics, ceramics, graphic arts, etc) and for those new graduates that wish to specialise in this inter-disciplinary area, so demanded by the industry. The main academic objective of the course is the knowledge of what is relevant, what is not and the skill to cleverly work around or approximate solutions about the exact colour control in each industrial sector⁶. To this end, we will search for equilibrium between the academic contents (learning to know) and basic abilities (learning to do). To carry out this, lectures and practical workshops using MsExcel and Matlab in PC platforms will be frequently used. In the same way, the students must go through a certain amount of homework, supervised through Internet with the help of some professors, which will mainly consist in reading specific bibliography and solving numerical exercises using MsExcel software. To reach this educational objective, or at least to try it, we have negotiated with the Spanish distributors of Datacolor, X-Rite, Konica Minolta and GretagMacbeth companies the supply of colour measurement equipments and colour management and formulation software for each three or four students. Following the same objective, the academic staff will be composed as much by lecturers as by colourist experts.

The maximum number of students for each course will be 30. The academic fees for the Colour Technology MSc programme are €2400. The University of Alicante offers scholarships to students applying this postgraduate course. Pre-registration will be place during the first half of July 2005. During the second half of this month the Director of Studies will publish the admission shortlist and the term to complete registration being necessary to pay on the application submission (10 % of the registration fees). This payment should be taken as a down payment from the rest of the registration fees. Students are allowed to decide on the payment terms (up to three terms): first 50 % on registration and the rest (25% each) along the academic year, depending on the length. In particular, the first 50 % registration payment for the students of the half-time edition course (from October 2005 to June 2006) will be done during September 2005, while for the students of the full-time edition course (from June to July 2006) will be done from April 2006 onwards.

3. Conclusion

The first Spanish MSc in Colour Technology starts the next academic year (2005-6). Its interdisciplinary educational approach will make easy the convergence of the different colour reproduction technologies with the properties of the human colour vision. The academic objective is to enable partial-skilled colourists and young graduates to acquire a sufficient grounding in the chemistry and physics of the formulation and application of coloured materials, a full appreciation of the theory and practice of modern methods of coloured image capture, manipulation and reproduction, understanding of methods of characterising coloured materials and the ability to use this knowledge to establish quality control procedures and production control tolerances. Therefore, we think that it is the first step in this country to participate into the co-ordinated development and consolidation of the MSc in Colour Engineering in European Union.

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