NEW FOUNDATIONS FOR ELECTRICAL ENGINEERING EDUCATION:

Hands-on Experience with Microcircuits,

Intelligent Machines and Microcomputers

by

N. DeClaris, P. Ligomenides and R. W. Newcomb
University of Maryland

SUMMARY

For more than half a century circuit concepts and methodology provided the foundation of electrical engineering undergraduate education. Introductory circuit courses and laboratories not only were the gateways to the upper class electives but set the tone and the educational viewpoint for the entire E.E. undergraduate education. Indeed this approach was highly successful. Generations of E.E.'s acquired a taste for the abstract, the elegance, and the economy of thought needed to deal with the technological problems of their era which recently were characterized by the fact that the hardware-related costs far exceed software-related costs. With the advent of microelectronics, and microprocessors in particular, we have now definitely entered the era where often hardware-related costs are far below software-related costs and they will be lower in the future. Moreover traditional single circuit models and methodology do not give the full picture of today's technology and hence more is needed at the beginners' level to guide designs and experiences with current hardware. But this is not the whole story. This paper examines and lists the pedagogical reasons which made circuit theory and experimentation so successful in E. E. education of the past. It is shown that similar educational needs are also present in the technological environment of the present decade but new vehicles for satisfying these needs must be used together with a different intellectual viewpoint. The paper then outlines a comprehensive educational plan which goes from the sophomore, through the junior to the senior year, recognizing and based firmly on microcircuits (IC chips), intelligent instruments and terminals, and microcomputer-networks. These are the principle components used both conceptually and in practice. The plan also emphasizes algorithmic, simulation, and iterative intellectual approaches to practical situations. The educational approach advocated here offers opportunities for the E. E. students starting from their sophomore year to acquire familiarity with the hardware used in industry today, and to also obtain experience with thought processes and technical methodologies which incorporate the same hardware when seeking to find solutions; many present technical problems cannot be solved by analytical approaches.

Subject matter for the first two courses in a desirable sequence (that includes theory and practice) will be presented. The recent experience of the authors with this type of approach will be reported. Finally the paper concludes with a discussion of the budgetary and administrative implications.