3. AN UNDERGRADUATE SYLLABUS WITH RESEARCH ORIENTATION IN ELECTRONICS AND COMMUNICATION ENGINEERING

*Puranchandra Rao V.**

Abstract

An undergraduate syllabus for B.E.(Hons) which is research oriented covering Electronics and Communication Engineering is suggested.The syllabus is based on the present one for B.E./ECE of Anna University Chennai.This is intended for students with special aptitude for research within the same timeframe of four years and such students comprise a ready channel for intake into R&D projects conducted in India and abroad. Also, in addition, a research qualification of Doctor in Engineering for such students will create a body of students well versed in research.

1.0 INTRODUCTION

The present syllabus followed by many Universities including Anna University for B.E. courses is very rigid and contents of the subjects to be taught are based on textbooks which are in many cases outdated.The creative energies of some students and their research interests are dormant throughout the four year period except in the last semester when they are asked to undertake a project. I was surprised to know that many first year students were doing a small project in the first year itself. The suggested syllabus includes experimental methods or practices for practical applications right from the first year itself.The major project work is included in the 6th and 7th semesters with provision to work in the vacation between 6th and 7th semesters.The outline of the syllabus is included in the Appendix.

2.0 WHO CAN TAKE THE HONOURS PROGRAMME?

The students who have joined the E.C.E. branch will have to be screened by senior staff members including the Head of the Deptt. A committee consisting of two senior faculty members and one from a research instituition can be formed to select the students who have the aptitude for research.The marks obtained by the students in XII class examination will only serve as a guide but not the only requirement.A set of questions is to be devised which can bring out the research interests of the student broadly in the field of electronics and communication, knowledge about PCBs (printed circuit boards), ICs(integrated circuits), TV sets, satellite radio, soldering etc.If the intake to ECE branch is 120(most engg. colleges have now) at least 30 students can be selected to undergo the 'Hons.'

**Director/E.C.E. Jaya Engineering College Chennai.*

course.There is always a provision that if the selected candidates do not show promise in the first two years they can be reverted back to the normal B.E. course.

3.0 METHODOLOGY ADOPTED TO DIRECT THE STUDENT TOWARDS RESEARCH AND INNOVATION

At present the student gains knowledge mostly through lectures based on textbooks which are sometimes outdated and does some pre-designated experiments in the laboratories. He does not have the chance to apply any innovative thoughts till the last semester where he has a chance to do a project on his own. In the proposed 'Hon'course the student is given an opportunity to learn new subjects in which he is interested, either by self-learning or through guidance of a staff member in tutorial classes assigned. In the 'elective'he can choose a subject of his own and it need not be in the list of electives designated. Tutorial periods even outside the working hours have to be assigned in order that the student can be guided to assimilate the knowledge available in the published literature or the worldwide web (www). All this may require some motivated teaching staff who also are required to be remunerated additionally depending on the output. Liason with industry is also recommended. Also a Systematic Learning Plan(SLP) as enumerated in [4] will be of immense help.

3.1 The student is encouraged to experiment with his ideas during the first two years of the course and to learn from failures.Finally he may come across a practicable idea which may be of immense value to the end users.

4.0 SALIENT POINTS IN THE MODIFICATION TO THE EXISTING SYLLABUS

The first year program of courses of the Anna University follows an annual pattern as shown in the Appendix.Electronics Practice-I is an additional practical subject introduced having one period tutorial and two periods practical.These periods can either be outside regular hours or on Saturdays. The tutorial can be taken by the regular teaching staff or knowledgeable laboratory assistants.In this, fabrication of PCBs, soldering and assembling elementary circuits are covered. From our feedback it is seen that many students are interested in doing such exercises.

4.1 In the second year (i.e.third semester) exercises in assembling more complicated circuits like filters, amplifiers and others including systematic testing have been included. In the fifth semester an elective subject which is chosen by the student for updating his knowledge has been indluded.Under experimental methods,simulation methods like visual spice or any other modern method has been included to groom the student in simulation of electronic circuits.

4.2 In the fifth semester,application of microprocessors and microcontrollers etc.in the form of a minor project has been added.ARM processors have also been included and the student can experiment with his own ideas on application of these devices. In the fifth and seventh semesters, the student has to undertake a major project which should cover a research topic of interest to the student and having practical application. Including the vacation between semesters, the student will have a long period of about nine months for doing a reasonably large project which can have application of new ideas. In the final semester only theoretical subjects including leftover ones are included.

5.0 WEB BASED EDUCATION

For the B.E.(Hons.) student, as the extra courses have to be taken within the same overall period of four years, a portal specially designed for him giving valuable information

and advice on the topics in which he has to gain knowledge will be of great help. Computer based education is known to reduce the time gap.The student can Work in his leisure time and he can clear doubts etc.in the tutorial classes planned. References to the international portals available can be supplied by the staff designated.

6.0 CONCLUSION

A research oriented syllabus for awarding B.E.(Hons.) has been suggested.This will be useful for students having aptitude for research and for elevation to a fast track for entry into either Dr. Engg. or Ph. D. A Dr. Engg. qualification less rigorous than Ph.D. and is recommended for entry of B.E. (Hons.) students based on the European model. As it is required that more emphasis is laid on research in India for the future as well as to meet the needs of Multi-National companies doing research projects in India, students with B.E. (Hons.) will suit the entry requirements. Research requirements already exist in ministries of Defence, Space and Atomic energy. Such a course can however be implemented easily in independent private Universities or earlier called deemed universities. Universities having affiliated colleges can also implement gradually. A similar course has been tried out in computer science at the International Institute of Information Technology, Hyderabad [2].

REFERENCES

[1] Dr. K. N. Nandurkar et.al. "Computer aided teaching of industrial management subject-a case study", Journal of Engg. Education-July 2006 pp 31-37.

[2] Rajeev Sangal "A research-oriented undergraduate curriculum in Computer Science" Journal of Computer Society of India-communications-January 2008 pp 31-35.

[3] A.V.S. Murthy "Design and development of computer based teaching and training modules" Journal of Engg.Education-October 2007 pp 12-17.

[4] Seema Shah "Systematic Learning Plan (SLP) model-to map global standards in Technical Education" Journal of Engg. Education-October 2007 pp 34-41.

Appendix

A suggested Syllabus for B.E. (Hons.) E.C.E. Corse

I - Year Annual Pattern

S. No.	Code No.	Course Title	L	T	P	M
		THEORY				
1	HS1XO1	Technical English	3	0	0	100
2	MA1X01	Engineering Matehmatics	3	1	0	100
3	PH1X01	*Engineering Physics*	3	0	0	100
4	CY1X01	Engineering Chemistry	3	0	0	100
5	EC1X01	Electronics Devices	3	0	0	100
6	EC1X02	Circuit analysis	3	0	2	100
7	GE1X01	Engineering Graphics	3	0	0	100
8	GE1X02	Computer Programming	2	0	2	100
		PRACTICAL				
9	PC1X01	Physics & Chemistry Laboratory	0	0	3	100
10	GE1X03	Engineering Practices Laboratory	0	0	2	100
11	EC1X03	*Electronics Practice-I*	0	1	2*	100

*Fabrication of PCBs, soldering and assembling elementary circuits.

III - Semester E.C.E.

S. No.	Code No.	Course Title	L	T	P	M
		THEORY				
1	MA1201	Mathematics - II	3	1	0	100
2	EE1211	Electrical Machines	3	0	0	100
3	CS1151	Data Structures	3	1	0	100
4	EC1201	Digital Electronics	3	1	0	100
5	EC1X01	Environmental Science and Engineering	3	0	0	100
6	EC1203	Electronic Circuits-I	3	1	0	100
		PRACTICAL				
7	EE1261	Electrical Machines Lab.	0	0	3	100
8	EC1204	Electronics Devices and Circuits Lab-I	0	0	3	100
9	CS1152	Data Structures Lab	0	0	3	100
10	EC1205	*ECE Practic-II*	0	2	2*	100

*Includes filters, amplifiers and more complicated circuits and testing

IV - Semester E.C.E.

S. No.	Code No.	Course Title	L	T	P	M
		THEORY				
1	MA1254	Random Process	3	1	0	100
2	EC1251	Electronic Circuits-II	3	1	0	100
3	EC1252	Signals & Systems	3	1	0	100
4	EC1253	Electromagnetic Fields	3	0	0	100
5	EC1254	Linear Integrated Circuits	3	0	0	100
6	EC1255	Measurements & Instrumentation	3	0	0	100
7	EC1256	*Elective*	2	1	1	100
		PRACTICAL				
8	EC1257	Electrornic Circuits II & Simultation Lab.	0	0	3	100
9	EC1258	Linear Integrated Circuits Lab	0	0	3	100
10	EC1259	Digital Electronics Lab.	0	0	3	100
11	EC1260	*Experimental Methods*	0	2	3*	100

*Includes filters, amplifiers and more complicated circuits and testing

V - Semester E.C.E.

S. No.	Code No.	Course Title	L	T	P	M
		THEORY				
1	MA1251	Elective	3	1	0	100
2	EC1301	Communication Theory	3	1	0	100
3	EC1302	Digital Signal Processing	3	1	0	100
4	EC1303	Microprocessors & its Applications	3	0	0	100
5	EC1304	Control Systems	3	1	0	100
6	EC1305	Transmission Lines & Waveguides	3	1	0	100
7	EC1306	*Elective*	2	1	1	100
		PRACTICAL				
8	EC1307	DSP Lab	0	0	3	100
9	EC1308	Microprocessors & Application. Lab	0	0	3	100
10	EC1309	*Minor Project*	0	0	2*	100

*Application of microprocessors & microcontrollers including ARM

VI - Semester E.C.E.

S. No.	Code No.	Course Title	L	T	P	M
		THEORY				
1	MG1351	Principles of Management	3	0	0	100
2	EC1351	Digital Communication	3	1	0	100
3	EC1352	Antenna & Wave Propagation	3	1	0	100
4		Elective - I	3	0	0	100
		PRACTICAL**				
5	EC1353	Communication System Lab.	0	0	3	100
6	EC1354	Network & Electronic System Design Lab.	0	0	3	100
7	EC1355	*Major Project - I*	0	0	8*	100

** communication & soft skills also covered in this semester

*should cover a research project with practical application

VII - Semester E.C.E.

S. No.	Code No.	Course Title	L	T	P	M
		THEORY				
1	EC1401	VLSI Design	3	0	0	100
2	EC1402	Optical Communication	3	1	0	100
3	EC1403	Microwave Engg.	3	0	0	100
4		Elective - II	3	0	0	100
		PRACTICAL				
5	EC1404	VLSI Lab.	0	0	3	100
6	EC1405	Optical & Microwave Lab.	0	0	3	100
7	EC1406	*Major Project - II*	0	0	8*	100

*continued from previous semester

VIII - Semester E.C.E.

S. No.	Code No.	Course Title	L	T	P	M
		THEORY				
1	CS1302	Computer Networks	3	0	0	100
2	CS1251	Computer Architecture	3	0	0	100
3	EC1009	Digital Image Processing	3	0	0	100
4		Elective - III	3	0	0	100
		PRACTICAL				
5	EC1451	Mobile Communication	3	0	0	100
6		Elective -IV.	3	0	0	100
7		Elective - V	3	0	0	100

*continued from previous semester

L : Lectures T : Tutorial P : Practical M: Marks