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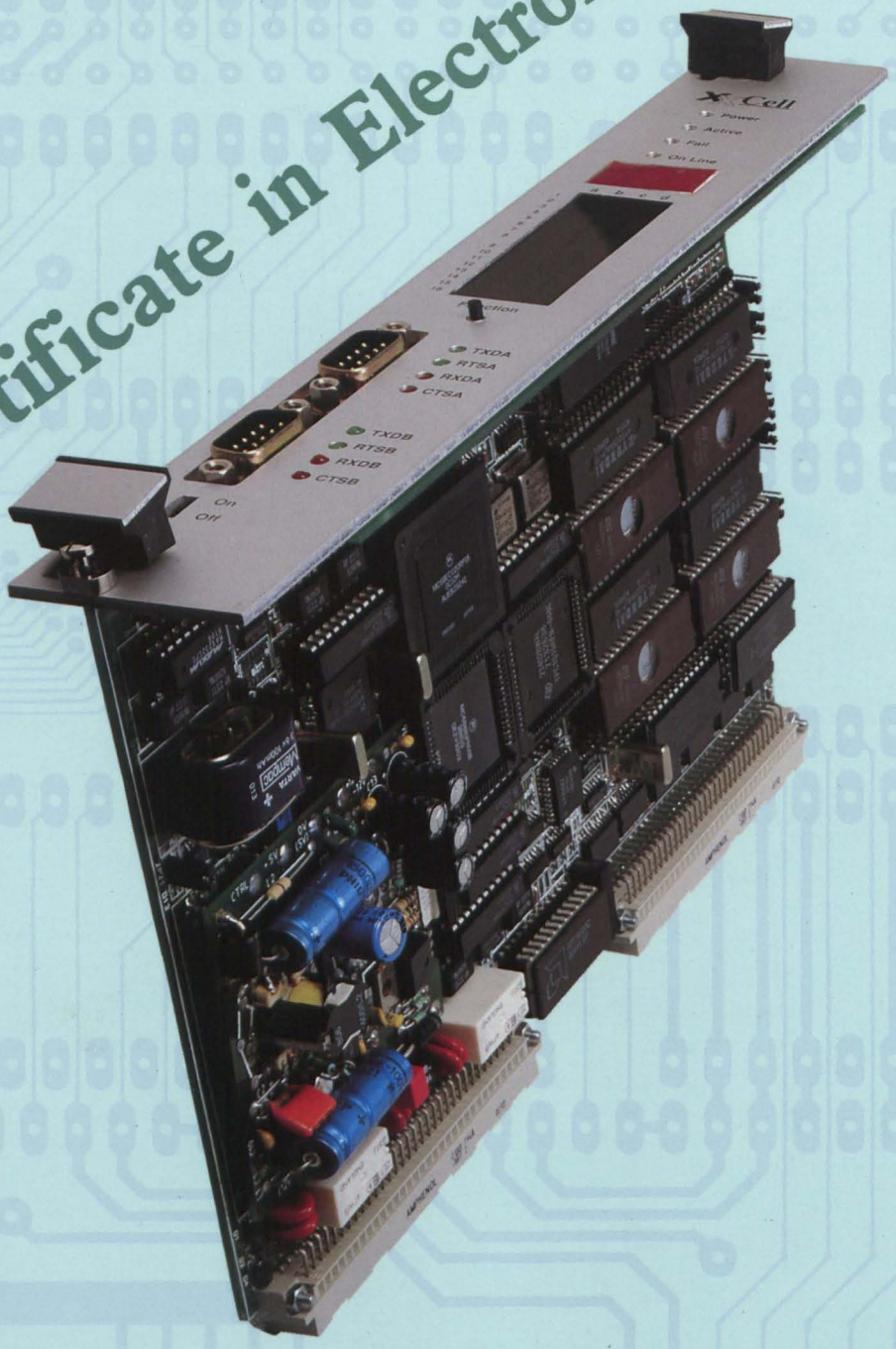
Certificate in Electronics

Dublin Institute of Technology

Certificate in Electronics



Teastas san Leictreonachas

DUBLIN INSTITUTE OF TECHNOLOGY KEVIN STREET DUBLIN 8

INSTITIÚID TEICNEOLAÍOCHTA BHAILE ÁTHA CLIATH SRÁID CHAOIMHIN BÁC 8

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Department of Electronic & Communications Engineering
Roinn na hInnealtóireacht Leictreonach agus Cumarsáide

TECHNICIAN CERTIFICATE IN ELECTRONICS
TEASTAS TEICNEORA SAN LEICTREONACHAS
CAO/CAS Ref. DT289

INSTITIÚID TEICNEOLAÍOCHTA
BHAILE ÁTHA CLIATH

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Teastas Teicneora san Leictreonachas

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INTRODUCTION

The Dublin Institute of Technology at Kevin Street has a long and proud tradition in electronics, both nationally and internationally, and the Department of Electronic and Communications Engineering has played a leading role in the national development of technical education in this area. Our reputation has been built on the expertise of our staff and the high quality and performance of our graduates in industry over many decades. Our graduates have contributed very significantly to the growth of this industry and we continue to commit our energies to the development of programmes of study which are relevant to the ever-changing needs of this important sector.

At the present time, the electronics sector is the most exciting and technologically advanced in Ireland, producing highly sophisticated components and systems for both home and export markets. The industry is extremely broad in scope and encompasses activities in areas such as communications, avionics, computing, industrial equipment, and consumer electronics products. Consequently, a wide range of challenging and rewarding career opportunities exists at every level within the industry, in design and development, production, servicing, testing, quality control, and technical sales and support. It is an industry which, from a relatively small base during the 1960s, experienced explosive growth during the 1970s and became established as a stable and mature sector during the 1980s. Despite the cyclical recessions which seem to be a feature of all industrial activity throughout the world, the industry continues to show growth across the full spectrum of its activities. At the present time, it employs some 32,000 persons representing about 17.7% of our total manufacturing employment. The electronics industry is ideally suited to this country, relying on knowledge and skills rather than on material resources, and our economic development will depend critically on its continued growth. A pre-requisite for such growth is the availability of a well-qualified and highly-motivated workforce and the range of courses in electronics at DIT Kevin Street have been designed to prepare our students to meet this need.

The two-year wholetime course in electronics, detailed in this document, leads to the award of the Technician Certificate in Electronics of the Dublin Institute of Technology. The course is intended to prepare our young people to meet the needs of the industry at technician level, primarily in the manufacturing and service sectors. The orientation is essentially practical; the emphasis is specifically on the development of the range of skills essential for working in an industrial environment which is subject to constant technological change.

Christopher V. Cowley
Head of Department,
Electronic & Communications Engineering.

INDEX

1. COURSE BACKGROUND AND OBJECTIVES

1.1 INTRODUCTION

The Technician Certificate Course in Electronics is a two year wholetime programme of study leading to the award of the

TECHNICIAN CERTIFICATE IN ELECTRONICS

of the Dublin Institute of Technology.

The course was established in 1981 in response to demands from industry for technicians to work in areas and at a level which did not require the depth and breadth of treatment provided in the various three-year technician diploma courses in electronics offered by the College. In addition, provision is made to accommodate trainee technicians from the aviation industry by incorporating a specialist option in Avionics.

1.2 COURSE OBJECTIVES

The course is designed to provide a broadly based education in the fundamental principles and practice of electronic engineering at a level appropriate to the electronic technician seeking to obtain employment in the production, test and service sectors of the electronics, communications or computer industry.
The course orientation is essentially practical with emphasis on the development of diagnostic and fault-finding skills. However an appropriate mathematical and engineering science foundation is incorporated to ensure that students wishing to extend their studies at some future date will be enabled to do so. In addition, a European language is studied in each year of the course.

1.3 COURSE AIMS

The primary aims of the course are:

(a) To develop a basic understanding of the mathematical and scientific principles which are appropriate for the study of electronics at technician certificate level.
(b) To provide a thorough grounding in the principles and practice of electronics encompassing the areas of
    Electronic Circuits and Systems.
    Microprocessor Systems.
    Communications Systems.
(c) To provide for the development of the practical skills necessary for effective working in the industrial environment.
(d) To integrate computer techniques into the various programmes of study.
(e) To develop the ability to communicate information and ideas clearly in both written and oral form.
(f) To provide an outline of the industrial environment within which the graduate will work.
(g) To provide instruction in a foreign European language sufficient to provide students with basic practical skills for communication, with an emphasis on aural comprehension and oral skills.

2. ADMISSION

There are three classes of entrant to the first year of the course. These are school leavers, mature persons and avionic trainees.

Entry to the second year of the course is normally restricted to those students who are successful in the first year examinations. Direct entry to the second year is permitted, in certain circumstances, to persons from other third-level institutions.

2.1 SCHOOL LEAVERS

The minimum entry requirements are:

(a) an Irish Leaving Certificate in five subjects with a grade C3 or higher in ordinary level mathematics. A pass in English at either level is a mandatory requirement.

or

(b) Any qualification which the College deems to be equivalent to (a) above.

Applications for admission to the course are processed through the Central Applications Office using the CAO/CAS joint application form.

2.2 MATURE APPLICANTS

A mature applicant is one who will be, as a minimum, twenty-four years of age at the time of enrolment in the course. Such applicants may be admitted to the first year of the course without meeting the admission requirements set out in 2.1 above if the College is satisfied that the applicant may benefit from the course.

Application for admission to the course as a mature candidate is made using the CAO/CAS joint application form.

2.3 AVIONICS OPTION

The course is designed to provide a specialist option in Avionics to accommodate trainees from the Aviation industry.

Such students must be employed as trainee technicians in the area of electronics and communications in the Avionics sector of the industry.

Students pursuing this specialist option in Avionics must:

(a) Be employed in the Aviation industry.
(b) Satisfy the entry requirements set out on 2.1 (a) above.

In these cases selection is carried out by the Technical Training Department of the company.

2.4 TRANSFER APPLICANTS

Applicants seeking permission to enter directly to the second year of the course, on the basis of a relevant third-level background, are required to make application on the standard DIT Transferee Application Form. Such applicants are interviewed by the College in order to determine their suitability for the course.

3. COURSE DESIGN

3.1 MAIN COURSE STRUCTURE

The course is full-time and is structured in semester form over two years with each academic year being of 34 weeks duration. Each semester is of 14 weeks duration and involves attendance at lectures, tutorials, laboratory and project work for 28 hours each week. This results in total class contact time of 392 hours per semester or 1,568 hours for the complete course (excluding examination time). Students undertake an engineering project in each year of the course in addition to the programme of laboratory work.

The various programmes of study undertaken during each semester are organized in modular form so as to allow for module examination at the end of each semester.

The basic structure of the academic year for each year of the course is as follows:

	Duration	*Week Number*
1st. semester	14 weeks	week 1 – week 14
1st. semester examinations	1 week	week 15
Marking & board meetings	2 weeks	week 16 – week 17
2nd. semester	14 weeks	week 18 – week 31
2nd. semester examinations	1 week	week 32
Marking & board meetings	2 weeks	week 33 – week 34

Note: Holiday periods are not included in the week count.

The Winter semester of each year commences in the third week of September and concludes in the first week in January. The Summer semester of each year commences in the first week of February and concludes in the third week in May. This structure results in a teaching year of twenty-eight weeks of class contact.

3.2 YEAR 1

The first year of the course is designed to establish the fundamentals of modern electronic principles and practice through the study of mathematics, engineering science and electric circuits. These subjects provide the underpinning for the study of electronic circuits and systems and communications principles. A programme of laboratory work is provided in these areas to reinforce the class work and provide a means of developing the skills and disciplines which are required in the industrial environment. Particular attention is paid to developing good laboratory work practices and diagnostic skills. Students are required to maintain a log book detailing the laboratory work undertaken.

All students, with the exception of the Avionics option group, study a European language (either French or German) in each year of the course.

3.2.1 FIRST YEAR PROJECT

In addition to the formal laboratory programmes in engineering science, electric circuits and electronics students undertake a programme of study in electronic technology. This consists of an electronic systems project and an associated electronic workshop, and extends throughout the first year.

This programme is designed to:

(a) introduce safe working practice in the laboratory and develop an awareness of safety matters.
(b) develop the necessary basic skills in soldering and breadboarding.
(c) introduce production processes such as printed circuit board soldering and de-soldering and the handling and soldering of surface mount devices.
(d) develop the ability to read and interpret a schematic diagram.
(e) develop diagnostic and fault-finding skills.
(f) introduce an engineering applications theme which permeates the whole course.

The project is based on the building and testing of sub-circuits which are combined to produce a small electronic system. A carefully structured programme of computer aided design methods is closely coupled to this project activity. Students are required to produce project schematic diagrams in this CAD environment and, in addition, generate artwork for the production of printed circuit boards.

Basic engineering workshop skills are developed through a programme of instruction and practice in the mechanical workshops.

In addition to the CAD work associated with the first year project, students are introduced to computer applications and programming. This involves the use of the personal computer with its associated operating system, word processing and spreadsheet applications and a structured programming language (Pascal).

3.3 YEAR 2

In the second year of the course the mathematics and electric circuits foundation is extended by further study of these subjects.

The study of electronic circuits and systems, in both the analogue and digital domains, forms the major part of the electronics core in this year. The ability to read and interpret data sheet information is developed with a particular emphasis on the application and practical limitations of commercial devices. In the laboratory, emphasis is placed on the development of practical competence in the building and testing of circuits and on the development of diagnostic and fault-finding skills. A course in electronic measurements is introduced, as part of the Electric Circuits course, to provide the necessary background for the effective use of a range of measuring instruments. Emphasis is placed on the characteristics and limitations of test and measuring equipment.

The systems theme is extended by the study of microprocessor systems and communications systems. The course in digital electronics supports the study of microprocessor systems which concentrates on the functional characteristics of devices in this area. Both 8-bit and 16-bit processors are examined and the various memory and input/output devices dealt with in detail. Particular emphasis is placed on interfacing to the microprocessor by considering a range of typical applications. The necessary software skills are developed through the writing of control routines for the various applications.

System considerations also dominate the study of communications engineering. The necessary underlying principles, introduced in the first year, are further developed and used as the basis for study of actual communication systems. Data and other non-voice communications systems are examined and students are introduced to the concept of an integrated broadband communications network. The physical limitations of the transmission medium are also examined.

3.3.1 FINAL YEAR PROJECT

The purpose of the technical project in the final year of the course is to provide students with the opportunity to demonstrate the skills and techniques which they have acquired during the course of their studies. Students are required to carry out the following tasks:

(a) Interpret a written brief.
(b) Breadboard and test a prototype circuit.
(c) Produce an engineered product.
(d) Prepare a written report.

Students are not expected to carry out any significant level of design but are required to exercise choice in relation to such matters as component selection, power supply requirements, type of enclosure etc. The production of an engineered product involves the layout and production of a printed circuit board(s). The use of CAD tools is an essential part of this work. Students are required to maintain a working log book to catalogue the progress of the work.

3.4 THE AVIONICS OPTION

This option is designed to provide, in addition to the main core subjects, the specialist aircraft related material appropriate to the Avionics trainee technicians. These trainees are recruited by the company as trainee technicians and undergo a four year apprenticeship in Avionics. During the first two years of this apprenticeship the trainees attend the College on a full-time basis and undertake a course of study at the same level as those in the main Certificate group. Specialist course material appropriate to the Avionics industry is provided in the College on a one-day per week basis over the two years of the course. The course lectures and the associated practical work in this option form a part of the preparation to sit the three Avionic Basic Aeronautic Engineering Certificate examinations of the Department of Communications.

(NOTE: These examinations are intended to be completed within the four-year training period but do not form part of the examination programme of the certificate course.)

The main areas of specialist study are:

(a) Air Legislation.
(b) Aircraft Instrumentation.
(c) Aircraft Electrical Systems.
(d) Aircraft Radio Systems.

4. COURSE CURRICULUM

The curriculum for each year of the course is set out, by semester, in the following sections. The first digit of the subject code identifies the semester. In each case the weekly allocation of time to lecture, tutorial and laboratory work is given. Certain subjects in year 1, such as Electronic Technology and Engineering Workshop, are entirely laboratory-based.
Tutorial work is formally scheduled in the first year of the course. In the second year tutorials are scheduled, as required, by individual lecturers as part of the allocation for laboratory work.

4.1 CURRICULUM: YEAR 1, SEMESTER 1

Code	*Subject*		*Hours/Week* *Lect*	*Lab*	*Tut*
1.1	Mathematics		2		1
1.2	Engineering Science		2	2	1
1.3	Electric Circuits		2	2	1
1.4	Electronic Circuits and Systems		2	2	1
1.5	Electronic Technology (a)			4	
1.6	Avionics (b)		2		
1.7	Avionics Technology (b)			4	
1.8	Engineering Workshop			2	
1.9	Computer Programming			2	
1.10	European Language (a)		2		
Total hours per week: 28		Main group	10	14	4
		Avionics option	10	14	4

Note: (a) The subjects Electronic Technology and Language are taken by the Main group only.

(b) The subjects Avionics and Avionics Technology are taken by the Avionics option group only.

4.2 CURRICULUM: YEAR 1, SEMESTER 2

Code	*Subject*		*Hours/Week* *Lect*	*Lab*	*Tut*
2.1	Mathematics		2		1
2.2	Engineering Science		2	2	1
2.3	Electric Circuits		2	2	1
2.4	Electronic Circuits and Systems		2	2	1
2.5	Electronic Technology (a)			4	
2.6	Avionics (b)		2		
2.7	Avionics Technology (b)			4	
2.8	Computer Programming			2	
2.9	Communications Engineering		2		
2.10	European Language (a)		2		
Total hours per week: 28		Main group	12	12	4
		Avionics option	12	12	4

Note: (a) The subjects Electronic Technology and Language are taken by the Main group only.

(b) The subjects Avionics and Avionics Technology are taken by the Avionics option group only.

4.3 CURRICULUM: YEAR 2, SEMESTER 1

Code	Subject	Hours/Week Lect	Lab/Tut
3.1	Mathematics	2	
3.2	Electric Circuits	2	
3.3	Electronic Circuits & Systems (Analogue)	3	2
3.4	Electronic Circuits & Systems (Digital)	2	
3.5	Microprocessor Systems	3	2
3.6	Communications Engineering	3	2
3.7	Project (Electronics) (a)		4
3.8	Avionics (b)	2	
3.9	Project (Avionics) (b)		4
3.10	Industrial and Communication Studies	1	
3.11	European Language (a)	2	
Total hours per week: 28	Main group	18	10
	Avionics option	18	10

Note: (a) The subjects Project (Electronics) and Language are taken by the main group only.

(b) The subjects Avionics and Project (Avionics) are taken by the Avionics option group only.

4.4 CURRICULUM: YEAR 2, SEMESTER 2

Code	Subject	Hours/Week Lect	Lab/Tut
4.1	Computing	2	
4.2	Electric Circuits	2	
4.3	Electronic Circuits & Systems (Analogue)	3	2
4.4	Electronic Circuits & Systems (Digital)	2	
4.5	Microprocessor Systems	3	2
4.6	Communications Engineering	3	2
4.7	Project (Electronics) (a)		4
4.8	Avionics (b)	2	
4.9	Project (Avionics) (b)		4
4.10	Industrial and Communication Studies	1	
4.11	European Language (a)	2	
Total hours per week: 28	Main group	18	10
	Avionics option	18	10

Note: (a) The subjects Project (Electronics) and Language are taken by the main group only.

(b) The subjects Avionics and Project (Avionics) are taken by the Avionics option group only.

5 EXAMINATIONS AND ASSESSMENTS

Students are examined in all subjects studied in a particular semester at the end of that semester, except in those subjects which are continuously assessed.

For each year of the course semester examinations are held in January and May for the first and second semesters respectively. Supplemental examinations for both semesters of the first year are held in September. No supplemental examinations are held in the final year.

5.1 EXAMINATION FORMAT

Assessment is in the form of written examination, continuous assessment or a combination of both.

Each written examination, with the exception of European Language, comprises:

(a) A mandatory question consisting of 5 parts which together broadly cover the subject material for the course. Each part has an allocation of 10 marks.
(b) A choice of two questions out of three, with an allocation of 25 marks for each question.

5.2 LABORATORY COURSE ASSESSMENT

Laboratory courses are assessed in each year of the course on a continuous basis. In order to pass a laboratory course, a student must obtain an overall assessment mark of at least 40% for that course. The overall laboratory assessment mark in each year is obtained as the arithmetic mean of the assessment marks in each semester of that year.

5.3 EUROPEAN LANGUAGE ASSESSMENT

The European Language course is assessed on a continuous basis throughout the course. In addition a written examination is held at the end of the first semester of each year and an oral/aural test is held at the end of the second semester of each year. The written examination at the end of the first and third semesters consists of three mandatory questions.

These various assessment components and their relative contributions to the student's result in this subject are set out below.

Winter Semester		**Spring Semester**	
Written examination	50%	Oral/aural test	50%
Continuous assessment	50%	Continuous assessment	50%

The continuous assessment consists of the following elements:

3 Homework assignments	25%
1 Class test (mid-semester)	25%

In order to pass the European Language assessment a student must obtain an overall assessment mark of at least 40%. The overall assessment mark in each year is obtained as the arithmetic mean of the assessment marks in each semester of that year.

5.4 FIRST YEAR EXAMINATIONS

The list of examination subjects, type of assessment and mark allocation for the first year examinations is set out in Table 1 for the first semester and Table 2 for the second semester.

The laboratory subjects which are assessed in this year are Engineering Science, Electric Circuits and Electronic Circuits & Systems. The Engineering Workshop module studied during the first semester only is assessed during that semester.

In the case of Electronic Technology, the assessment consists of a continuous assessment component which extends over the full year and a laboratory-based practical test which takes place at the end of the first year.

Note: (a) The subject Avionics is taken by the Avionics option group only.

(b) The subject European Language is taken by the main group only.

The results of the first semester examinations in percentage form are available to the students prior to the commencement of the second semester.

5.4.1 TABLE 1 — SEMESTER 1 EXAMINATIONS

No.	*Subject*		*Exam*	*Assessment*	*Total*
1.1	Mathematics		100		100
1.2	Engineering Science		100	100	200
1.3	Electric Circuits		100	100	200
1.4	Electronic Circuits & Systems		100	100	200
1.5	Electronic Technology			100	100
1.6	Avionics		100		100
1.7	Avionics Technology			100	100
1.8	Computer Programming			100	100
1.9	Engineering Workshop			100	100
1.10	European Language		50	50	100
	Total:	Main group	450	650	1100
		Avionics option	500	600	1100

5.4.2 TABLE 2 — SEMESTER 2 EXAMINATIONS

No.	*Subject*		*Exam*	*Assessment*	*Total*
2.1	Mathematics		100		100
2.2	Engineering Science		100	100	200
2.3	Electric Circuits		100	100	200
2.4	Electronic Circuits & Systems		100	100	200
2.5	Avionics		100		100
2.6	Electronic Technology		100	100	200
2.7	Avionic Technology		100	100	200
2.8	Programming			100	100
2.9	Communications Engineering		100		100
2.10	European Language			100	100
	Total:	Main group	600	600	1200
		Avionics option	700	500	1200

5.5 SECOND YEAR EXAMINATIONS

The list of examination subjects, type of assessment and mark allocation for the final year is set out in Table 3 for the third semester and Table 4 for the fourth semester.

There is a common laboratory course for the following subjects:

(a) Electric Circuits and Electronic Circuits & Systems (Analogue).
(b) Electronic Circuits & Systems (Digital) and Microprocessor Systems.

The project work in the final year and the accompanying project report are assessed by a group consisting of the supervisor and two co-examiners. Students are required to present the results of the project work to the assessment panel and to defend this work at an oral examination. The assessment panel consists of the Course Director, the project supervisor and a co-examiner. In order to pass this assessment a student is required to obtain a result of at least 40%.

The format of the assessors marking sheet is set out in Fig. 1 and indicates the weighting attached to each of the project elements which are assessed.

Section	*Work*	*Assessors Mark (%)*	*Weighing Factor*	*Weighted Mark*
A.	Review of literature		1	
	Adherence to scheduled timetable		2	
	Log Book		2	
	Overall Conduct of Project		1	
B.	P.C.B. Design		1	
	Cabinet Design		1	
	Soldering		1	
	General Workmanship/Wiring		1	
C.	Test and Measurements		2	
	Presentation of Results		2	
D.	Report (Text)		2	
	Report (Diagrams)		1	
E.	Demonstration		3	

Fig.1

Industrial and Communication Studies is assessed during each semester of the final year. The assessment consists of the following elements:

4 Homework Assignments — 50%
1 Class test (end of semester) — 50%

Students are not issued with examination results in January for the third semester examinations. General performance indicators are, however, issued for each examination subject so as to provide the student with feedback on his/her level of achievement in that semester. These indicators define achievement as either very satisfactory, satisfactory, poor or very poor.

5.5.1 TABLE 3 — SEMESTER 3 EXAMINATIONS

No.	*Subject*		*Exam*	*Assessment*	*Total*
3.1	Mathematics		100		100
3.2	Electric Circuits		100 }	100	300
3.3	Electronics 1		100 }		
3.4	Electronics 2		100 }	100	300
3.5	Microprocessor Systems		100 }		
3.6	Communications Engineering		100	100	200
3.7	Avionics		100		100
3.8	Project			200	200
3.9	Industrial and Communication Studies			50	50
3.10	European Language		50	50	100
	Total:	Main Group	650	600	1250
		Option Group	700	550	1250

5.5.2 TABLE 4 — SEMESTER 4 EXAMINATIONS

No.	*Subject*		*Exam*	*Assessment*	*Total*
4.1	Computing			100	100
4.2	Electric Circuits		100 }	100	300
4.3	Electronics 1		100 }		
4.4	Electronics 2		100 }	100	300
4.5	Microprocessor Systems		100 }		
4.6	Communications Engineering		100	100	200
4.7	Project			300	300
4.8	Avionics		100		100
4.9	Industrial and Communication Studies			50	50
4.10	European Language			100	100
	Total:	Main Group	500	850	1350
		Option Group	600	750	1350

Note: (a) European Language is taken by the main group only.

(b) Avionics is taken by the Avionics option group only.

5.6 CATEGORY OF AWARD

The Certificate is awarded by the Dublin Institute of Technology to students who have completed the course of study and achieved a pass in each of the assessment components. The mark in each examination subject in the final year is the sum of the total marks obtained in that subject in the third and fourth semester examinations. The category in which the award is made is based on the overall percentage mark obtained in the final examinations and this is calculated as the sum of the marks in each examination subject as a percentage of the maximum overall mark of 2600. This represents an allocation of 42% of the total marks to the

practical activities in the final year of the course. The categories of award and the corresponding range of marks are as follows:

Category of Award	*Overall Average Mark*
Distinction	70%-100%
Merit	60%-69%
Pass	40%-59%

5.7 EXAMINATION REGULATIONS

The general Examination regulations of the Dublin Institute of Technology govern all examination and assessment procedures on the course.

In addition the following course-specific regulations apply:

5.7.1 Progress to the final year of the course will normally only be permitted to those students who have completed both first year semesters and passed the first year semester examinations.

5.7.2 A student who fails to achieve the pass mark in one or more of the semester written examinations will be required to re-sit only the failed components at the next examination sitting. In such cases students are normally only permitted three further attempts to achieve the required pass(es). Failure at the fourth sitting will normally result in failure of the course.

5.7.3 A student who is required to sit supplemental examinations for both first-year semesters and who passes the supplemental examination in respect of one semester will not be required to re-attend that semester and will not be permitted to re-sit the semester examinations.

5.7.4 In any year of the course an examination candidate who fails to satisfy in one or more of the continuous assessment requirements may be refused permission to sit the written examination, if any, associated with that component of the course.

5.7.5 Except in very special circumstances and at the discretion of the Principal, candidates will not be permitted to sit any supplemental examination unless they have taken the first sitting of the relevant semester examination in its entirety.

5.7.6 Failure to sit any examination will result in failure of that examination. In such cases the candidate will require the written permission of the Director to retake that examination at a later date.

5.7.7 A candidate who, at the first sitting of a written examination in a subject which has a laboratory component, fails to achieve the pass mark may, at the discretion of the Examination Board, be deemed to have passed if

(i) the overall average mark in the combined elements is at least 45%
and
(ii) the mark in the written component is not less than 30%.

5.7.8 In the first year a candidate who, at the first sitting of any written examination, fails to achieve the pass mark in one subject may, at the discretion of the Examination Board, be deemed to have passed if

(i) the performance in the other written examinations is particularly satisfactory
and
(ii) the result in the failed subject is not less than 30%.

5.7.9 A candidate who, in the final examinations, fails to achieve the pass mark in one subject may, at the discretion of the Examination Board, be deemed to have passed if

(i) the performance in the other written examinations and the Electronics or Avionics Project is particularly satisfactory

and

(ii) the result in the failed subject is not less than 30%.

5.7.10 A student who is required to re-sit one or more written examinations in the final year will, if successful, be eligible for the certificate award at Pass level only.

5.7.11 A final year candidate who fails to obtain a pass mark in the Electronics or Avionics Project will be required either to

(i) revise and re-submit the existing Project

or

(ii) undertake and submit a new Project for consideration at the next final-year Examination Board in which case the certificate will be awarded at Pass level only.

5.8 EXAMINATION BOARD

The Examination Board shall be constituted in accordance with the regulations of the Academic Council and of the Institute.

The function of the examination board is to determine what shall be the result for each candidate of the mandatory tests comprising the examination. This determination is made in accordance with the approved marking schemes and the regulations for the course and the examination.

The Academic Council of the Dublin Institute of Technology is the authority for the confirmation of examination results.

External examiners are nominated by the Institute and the appointment is subject to approval and confirmation by Academic Council.

6 COURSE ORGANIZATION AND CONTROL

Overall responsibility for the formal administration and operation of the course is vested in the Head of the Department of Electronic and Communications Engineering. The Department Head, through the Course Director, ensures that the aims and objectives of the course are realized. The Course Director is appointed by the Department Head to take responsibility for course planning and organization and to direct the activities of the Course Committee.

Year co-ordinators are appointed to act on this committee and provide the means whereby overall course control is achieved. In addition, Tutors provide a point of contact for students and act as a means of identifying and rectifying difficulties which arise during the students course of study.

6.1 COURSE DIRECTOR

The Course Director is appointed by the Head of Department and occupies the post for a term of five years.

The Course Director has the following specific duties and responsibilities:

(a) to liaise with the Head of the Department on matters concerning the organization and operation of the course.
(b) to formulate proposals for updating course syllabi and to chair meetings with staff involved in syllabus revisions.
(c) to arrange, in association with the Head of Department, for the appointment of year co-ordinators for each year of the course.
(d) to organize and chair meetings of the Course Committee.
(e) to organize from time to time, and in any event at least twice each semester, a general meeting of all staff teaching on the course.
(f) to be responsible for the organization and monitoring of final-year project work.
(g) to prepare an annual report.

6.2 COURSE COMMITTEE

The composition and terms of reference of the Course Committee are as follows:

(a) the Course Director (chairman).
(b) the Head of Department (ex-officio).
(c) the Assistant Head of Department.
(d) the Year co-ordinators for each year of the course.
(e) a representative from each department servicing the course.

6.2.1 TERMS OF REFERENCE

(a) to monitor the effectiveness of the course.
(b) to make recommendations for updating the course.
(c) to monitor and make recommendations on the methods of assessment.
(d) to monitor continuous assessment progress for each student.
(e) to monitor the progress of course project work.
(f) to monitor and track student performance from year to year.

6.3 YEAR CO-ORDINATORS

The year co-ordinator is responsible for monitoring the operation of a particular year of the course and co-ordinating the activity of staff involved in that year. In particular the co-ordinator will ensure that the various subject areas contribute to the stated aims and objectives of the course. The year co-ordinator will provide feedback to the course committee on the operation of the course in that year and make recommendations for modifications as appropriate.

The year co-ordinator will monitor student performance in that year and ensure that student difficulties are identified at an early stage and remedial action taken. In this regard the year co-ordinator will liaise with the student tutors so as to ensure that appropriate feedback is provided to the student.

The year co-ordinator will interact with the relevant staff of the departments servicing the course and provide feedback to these departments on the appropriateness of subject material and the timing of subject treatment.

6.4 STUDENT TUTORS

Each tutor has a responsibility for no more than ten students and meets with this group at least twice per month. The tutor has the following specific duties:

(a) To establish and maintain contact with the assigned students.
(b) To encourage the students to identify and discuss issues which are inhibiting progress.
(c) To become familiar with the academic background of each student in the group and identify shortcomings in the student's knowledge and understanding.
(d) To monitor the academic performance of the students and provide appropriate supportive feedback.
(e) To refer difficulties in a particular subject area to the year co-ordinator.
(f) To meet with the year co-ordinator and the course director to discuss student difficulties and progress.

7 SYLLABUS STRUCTURE

The syllabus for each subject in the curriculum is set out in the following sections. These define the lecture material to be covered during each semester and hence the material to be examined at the end of each semester.

7.1 SYLLABUS INDEX: YEAR 1, SEMESTER 1

7.2 SYLLABUS INDEX: YEAR 1, SEMESTER 2

7.3 SYLLABUS INDEX: YEAR 2, SEMESTER 1

7.4 SYLLABUS INDEX: YEAR 2, SEMESTER 2

7.1.1 MATHEMATICS
Hours/Week: Lecture 2, Tutorial 1.

Review of basic mathematical topics e.g.
(i) indices, logarithms, linear equations.
(ii) the manipulation and evaluation of formulae.
(iii) the straight line and the circle.

Accuracy and error. Tolerances in values. Significant figures. Scientific notation. Use of electronic calculators.
Trigonometry. Degree and radian measure. Graphical representation of sinusoidal functions, amplitude, frequency, period and phase angle.
Graphical addition of sinusoidal waveforms of the same frequency. Phasor representation of addition.
Logarithms. Change of base. Base e.
Graphs: quadratic, cubic, logarithmic and exponential functions. Use of log-linear and log-log graph paper.
Complex numbers. Argand diagram. Modulus and argument. Polar form. Algebraic manipulation of complex numbers.

Recommended Text:
Bird, J.O. & May, A.J. Technician Mathematics 2. Longman, 2nd Edition. 1990.

7.1.2 ENGINEERING SCIENCE
Hours/Week: Lecture 2, Laboratory 2, Tutorial 1.

Mechanics. Vector and scalar quantities. Properties of vectors. Force. Newton's Laws. Addition and resolution of forces. Mass and weight. Work and energy.
Moments of a force, couples and torque. Power transmission by torque. Moments of inertia.
Stress and strain. Hook's Law. Elastic moduli.
Friction. Coefficient of friction. Lubrication.
Machines. Mechanical advantage, velocity ratio, efficiency. Levers, pulley systems screw jacks, gear drives, belt drives.
Motion of bodies, displacememt, velocity, acceleration. Newton's laws of motion.
Kinetic and potential energy. Motion under gravity.
Motion in a circle. Simple harmonic motion, periodic time.

Reference Texts:
Nelkon, M. & Parker, P. Advanced Level Physics. Heinemann, 6th Edition. 1988.

7.1.3 ELECTRIC CIRCUITS
Hours/Week: Lecture 2, Laboratory 2, Tutorial 1.

Electrical characteristics of a material, insulators, semi-conductors and conductor.
The electric circuit. Ohm's law, resistors in series and in parallel. Kirchhoff's voltage and current laws.
Energy and power in D.C. circuits. The joule and the watt.
Alternating current principles. A.C. signals in resistive circuits.
The electrostatic field. Coulomb's law. Electric field and electric field strength. Dielectrics, permitivity.
Capacitance, unit of capacitance. Energy stored in a capacitor. Capacitors in the A.C. circuit.
Magnetism and electromagnetism. Magnetizing force, flux and flux density. The magnetic circuit, Ampere's law. B/H curve and hysterisis loop.
Magnetic force due to an electric current, the left-hand rule.
Self inductance. Unit of inductance. Energy stored in an inductor.
Inductors in series and parallel.
Inductors in the A.C. circuit.
The ideal transformer with resistive load.

Recommended Text:
Boylestad, R.L. Introductory Circuit Analysis, 5th. Edition. Merrill Publishing Co. 1990.

Additional Reading:
Floyd, T.C. Principles of Electric Circuits, 3rd. Edititon. Merrill Publishing Co. 1989.
Walls & Johnstone. D.C./A.C. Principles, West Publishing Co. 1992.

7.1.4 ELECTRONIC CIRCUITS AND SYSTEMS
Hours/Week: Lecture 2, Laboratory 2, Tutorial 1

Arithmetic operations on signed binary numbers, sign and magnitude, 1 and 2's complement.
Series and parallel connections of switches. The truth table. Logic minimization. Karnaugh Maps.
Logic gates, the AND and OR gate, truth tables and standard symbols. Boolean representation of logic circuits.
The NAND and NOR gates, truth tables and standard symbols.
Typical gates in the 7400 TTL and 4000 CMOS families.
The Exclusive-OR function, truth table and standard symbol. Binary half-adder and full adder.
Voltage and current sources, equivalent circuits, current/voltage characteristics.
The voltage and current amplifier, transfer characteristic. Equivalent circuit.
Voltage and current gain, use of the decibel.
The ideal operational amplifier. Feedback configurations yielding non-inverting, inverting and summing configurations.

Recommended Text:
Floyd, T.C. Digital Fundamentals. McGraw Hill. 4th Edition. 1992.
Morris, J.C. Analogue Electronics Edward Arnold. 1st Edition. 1992.

Additional Reading:
Floyd, T.C. Electronic Devices. Merrill Publishing Co. 3rd Edition. 1992.

7.1.5 ELECTRONIC TECHNOLOGY
Hours/Week: Laboratory 4.

The electronic workshop: safety considerations.
Types of solder, flux and tinning. Dip and wave soldering. Desoldering.
Printed circuit boards, single-sided and double-sided boards, through-hole connections. Printed circuit board connectors.
Resistors, preferred values, tolerance, colour codes, ratings.
Capacitors: Capacitor types and applications.
Preferred values, colour codes, tolerance, ratings.
Discrete devices: methods of mounting and connecting.

Integrated devices: packages in general use, methods of mounting and connecting, precautions in handling. Surface mounted components, soldering and desoldering.
Computer-Aided Design. Drawing schematic diagrams using CAD techniques. Accessing component libraries. Placing and interconnecting components. Producing a netlist from the schematic. Drawing a printed circuit board outline.
Manual and autoplacing of components. Creating printed circuit artwork. Use of drafting film.

Reference Texts:
Lamit, L.G. Drafting for Electronics.
Charles E. Merrill. 1st Edition. 1985.
Skipp, R. Workmanship Standard Manual.
Blackwell Scientific. 2nd Edition. 1989.

7.1.6 AVIONICS
Hours/Week: Lecture 2, Laboratory 4.

General description of aircraft structure. Safety when working on aircraft. Introduction to avionics. ATA 100 System.
Theory of flight. Forces acting on an aircraft. Aircraft stability and control. Primary and secondary flight controls.
Manufacture and installation of aircraft looms. Correct manufacture, of crimped connectors and soldered connectors. Cable types.
Circuit protection and bonding. Millivolt drop tests. Bonding and insulation resistance tests.
Electrical systems. Basic components of the electrical system on an aircraft. Outline of various aircraft systems: AC & DC, split & parallel.
D.C. generators and systems. Principles and operation of D.C. generators. Generator characteristics. D.C. motors.

Recommended Texts:
Pallett, E.H. Aircraft Electrical Systems.
Longman Scientific and Technical. 3rd Edition. 1987.
Easmin, T. and Bent, R. Aircraft Electricity and Electronics. McGraw Hill. 4th Edition. 1989.

Reference Texts:
Pallett, E.H. Aircraft Instrument Systems.
Longman Scientific and Technical. 2nd Edition. 1981.

7.1.7 ENGINEERING WORKSHOP
Hours/Week: Laboratory 2.

Safety in the workshop.
An introduction to the manufacture and structure of engineering materials including ferrous and non-ferrous metals.
Preparation of surfaces, marking-out procedures, use of marking-out equipment.
Measurement and the use of measuring instruments and gauges. Tolerance, accuracy and error.
Benchwork and the use of hand tools.
Light metal fabrication.
Finishing of metals.

7.1.8 COMPUTER PROGRAMMING
Hours/Week: Laboratory 2.

Historical background and general description of computer systems. The personal computer, function of RAM, ROM and magnetic storage devices.
Definition of programme and data. Low-level and High-level programming languages. The operating system, DOS and DOS commands; Dir, Format, Copy, Del, Type, Md, Rd.
Introduction to Pascal programming, the compiler. Distinction between text and executable files.
Declaration of constants and variables, integer, real, character, string and Boolean. The assignment operator. Statements, the Write and Read statements.

Recommended Texts:
Pasahow, E.J. Pascal for Electronics.
McGraw Hill. 1st Edition. 1985.

7.1.9 EUROPEAN LANGUAGE
Hours/Week: Lecture 2.

7.1.9.1 FRENCH SEMESTER 1

Oral/Aural
Communication in contexts such as greetings and introductions, requesting and giving information, requesting and giving directions, making enquiries and reservations, shopping, ordering, eating out.
Expression and concepts of place, time, number, dimension, dates.

Reading/Writing
Material will be chosen from articles of current and topical interest in newspapers, magazines, etc., and used as a basis for discussion, the presentation of new vocabulary and grammar points.
Themes forming the basis of both oral and reading/written work will include family, background, characteristics, relationships, food and drink, leisure activities, places and people, traditions and cultural activities, young people and work, social and current affairs.

Grammar
Revision and practice of basic grammatical structures and the introduction to the more complex grammatical forms of formal registers.

Essential Texts:
Corless, Corless and Gaskell VECU : Signes du temps.
Hodder and Stoughton 1991.
Collins French Dictionary French/English - English/French.

7.1.9.2 GERMAN SEMESTER 1

Oral/Aural
Communication in general social contexts such as greetings and introductions, requesting and giving personal information, making enquiries and reservations. Talking about travel plans; hotels, hostels, dates, times. Registering at a hotel, spelling names.
Using public transport, buying rail and bus tickets.
Understanding and expression of place, time, numbers, days of week, dates, alphabet/spelling.

Reading/Writing
Reading and written work are intended to consolidate and support the oral/aural work; where appropriate, the textbook will be supplemented by items from magazines, brochures, advertisements, posters, etc.

Grammar
Present tense of regular and irregular verbs, imperative, word order/verb position, formation of questions, gender and uses of nominative and accusative cases, modal verbs, personal pronouns, possessive adjectives and pronouns, comparative.

Essential Texts:
Deutsch Aktiv Neu 1.
Collins German Dictionary: German/English – English/German.

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7.2.1 MATHEMATICS
Hours/Week: Lecture 2, Tutorial 1.

Calculus. Limits. Differentation of algebraic, trigonometric, exponential and logarithmic functions. Rates of change, maxima and minima.
Integration. The indefinite integral. Integration of simple algebraic functions and of trigonometric functions. The definite integral, area under a curve. Mean and mean-square values. R.M.S. values. Numerical integration, Simpson's rule.
Simultaneous linear equations in two and three variables.
Permutations, combinations and probability. Tabulation of data and graphical representation. Mode, median, mean and standard deviation.

Recommended Text:
Bird, J.O. and May, A.J. Technician Mathematics 2. Longman. 2nd Edition. 1990.

7.2.2 ENGINEERING SCIENCE
Hours/Week: Lecture 2, Laboratory 2, Tutorial 1.

Wave motion and sound. Longitudinal and transverse waves. Progressive and stationary waves. Wavelength, frequency and velocity of propagation.
Reflection, refraction and interference of waves. Beats, resonance and harmonics. The Doppler effect.
Compression waves. Propagation velocity in various media.
Speech. Energy distribution with frequency, dynamic range. Use of the decibel.
Light and electromagnetic radiation. Electromagnetic waves and the electromagnetic spectrum. Propagation of light. Reflection at plane and parabolic mirrors.
Refraction, total internal reflection, critical angle. Refractive index. Mirror and lens systems.
Colour. Primary colours, additive and subtractive effects.
Fibre optics: monomode and multimode, attenuation effects. Optical sources and detectors.
Heat. Quantity of heat, temperature scales, measurement of temperature. Specific heat capacity. Vapour pressure. Latent heats. Heat transfer. Thermal conduction in metals, non-metals and fluids. Measurement of thermal conductivity, thermal resistance. Heat sinks.
Convection. Newton's law of cooling. Radiation, absorption and emission of radiation.

Reference Text:
Nelkon, M. and Parker, P. Advanced Level Physics. Heinemann, 6th Edition. 1988.

7.2.3 ELECTRIC CIRCUITS
Hours/Week: Lecture 2, Laboratory 2, Tutorial 1.

The Superposition principle. Thevenin's theorem. Norton's theorem. Maximum power theorem.
Conductance, susceptance, reactance and admittance and representation by phasors.
Power in circuits containing reactances.
Series and parallel RLC circuits. Resonance, impedance at resonance.
D.C. excitation of RC and RL circuits. Time constant. Graphical relationships. Rise-time and fall-time.
Low-pass and high-pass passive RC filters. Frequency and phase response. The transfer function.
Measuring instruments: analogue and digital types. The moving coil instrument, extension of range.

Recommended Text:
Boylestad, R.L. Introductory Circuit Analysis. 5th. Edition. Merrill Publishing Co. 1990.

Additional Reading:
Floyd, T.C. Principles of Electric Circuits. Merrill Publishing Co. 3rd Edition. 1989.
Walls, R. and Johnstone, W. D.C./A.C. Principles. West Publishing Co. 1st Edition. 1992.

7.2.4 ELECTRONIC CIRCUITS AND SYSTEMS
Hours/Week: Lecture 2, Laboratory 2, Tutorial 1.

Positive feedback, the Schmitt trigger circuit. The voltage comparator. Applications.
The p-n junction, current/voltage characteristics. Diode voltage, current and power ratings.
Static and slope resistance.
The half-wave, full-wave and bridge rectifier. The resevoir capacitor. Regulation characteristic.
Avalanche and Zener diodes, application in a basic voltage stabilizing circuit.
Operation of the junction FET. Device characteristics. Biasing circuits, quiescent conditions. D.C. and A.C. load lines. A.C. equivalent circuit.
Operation of the bipolar transistor. Device characteristics, biasing circuits, A.C. equivalent circuit, the basic h-parameter model.
Current and voltage gain, input and output resistance.

Recommended Texts:
Floyd, T.C. Digital Fundamentals. McGraw Hill. 4th. Edition. 1992.
Morris J.C. Analogue Electronics. Edward Arnold. 1st. Edition. 1992.

Additional Reading:
Floyd, T.C. Electronic Devices. Merrill Publishing Co. 3rd Edition. 1992.

7.2.5 ELECTRONIC TECHNOLOGY
Hours/Week: Laboratory 4.

Assembly and testing of a three-function signal generator which provides square, triangle and sinusoidal outputs.

This work comprises:
Prototyping of basic sub-units.
Testing/fault-finding.
Use of CAD facility to generate circuit schematic and printed circuit artwork.
Production of printed circuit boards for sub-units.
Assembly of sub-units in printed circuit form.
Testing of complete generator against specification.
Preparation of a written report.

7.2.6 AVIONICS
Hours/Week: Lecture 2, Laboratory 4.

D.C. generators and systems. D.C. voltage regulation. Reverse current protection. Load sharing. Maintenance procedures.
External power. A.C. and D.C. external power systems Interlocks and fault protection. Ground Service Power.
Aircraft systems. Air conditioning and temperature control systems. Fire protection. Ice and rain protection.
Lights. Starting and ignition systems. Fuel systems. Hydraulic power. Landing Gear.

Recommended Texts:
Pallett, E.H. Aircraft Electrical Systems.
Longman Scientific and Technical. 3rd Edition. 1987.
Eismin, T. and Bent, R. Aircraft Electricity and Electronics. McGraw Hill. 4th Edition. 1989.

Reference Text:
Pallett, E.H.J. Aircraft Instrument Systems.
Longman Scientific and Technical. 2nd Edition. 1981.

7.2.7 COMPUTER PROGRAMMING
Hours/Week: Laboratory 2.

Structured programming, flowchars. The IF and CASE statements. Loop structure, the While loop, the Repeat Until loop, the For loop, Lables.
Arrays, their form and declaration. Applications of array structures. The Record structure.
File declaration, opening, reading, writing and closing of files.
Modular programming and top-down programme design. Procedures and functions. Global and local variables.
Parameter passing.
Further DOS commands. Redirecting output and input. Use of batch files.
Introduction to a general word processor package.

Recommended Text:
Pasahow, E.J. Pascal for Electronics.
McGraw Hill. 1st Edition. 1985.

7.2.8 COMMUNICATIONS ENGINEERING
Hours/Week: Lecture 2.

Sources of information, description of signals and waveforms carrying information. General communication systems in block diagram form.
Communications channels; transmission media, copper, fibre and radio. Radio frequency spectrum.
Analogue communications system: Telephony, simple telephone circuits, block diagram of the telephone network.
Modulation: the need for modulation. Basic waveforms for A.M., F.M. and P.M.
Amplitude modulation: simple A.M. waveforms described in time and frequency. Double sideband and single sideband modulation.
Basic block diagrams of DSBFC and SSBSC transmitters.
Frequency division multiplex.
Digital communication systems: data waveforms, bit rate, unipolar and bipolar coding.
The limitations of baseband transmission: the effect of noise and loss of data signals, error rate. Simple error detection and correction techniques.
The need for digital modulation, simple modulation schemes, OOK, ASK, FSK and PSK systems, basic waveforms.
Bandpass modulation systems: the modem, simple block diagram description, standards for modems, the V-series standards.

Recommended Text:
Smale, P.H. Telecommunications Systems.
Pitman Publishing Ltd. London. 1st. Edition. 1986.

7.2.9 EUROPEAN LANGUAGE
Hours/Week: Lecture 2.

7.2.9.1 FRENCH SEMESTER 2

Oral/Aural
Oral communication in contexts such as using the telephone, simple banking and post office procedures, applications and form filling.

Reading/Writing
Formal letter writing. Themes forming the basis for oral and reading/written work will include regions, principal towns, housing and living standards, unemployment, social problems, environment, social and current affairs.

Grammar
Exercises to improve grammatical accuracy and to practise more advanced structures occurring in written materials.

Essential Texts:
Corless, Corless and Gaskell VECU : Signes du temps.
Hodder and Stoughton 1991.
Collins French Dictionary French/English – English/French.

7.2.9.2 GERMAN SEMESTER 2

Oral/Aural
Communication in contexts such as ordering food and drink, shopping (food, clothes), requesting and giving directions, talking about family, visiting the doctor, buying medicine at the pharmacist's, understanding written (medical) instructions, exchanging travellers' cheques and foreign currency, posting letters and parcels, reporting loss/theft to police, description of self, others, family.

Reading/Writing
As for Semester 1; filling out application forms.

Grammar
Use of the dative case, perfect tense, word order in subordinate clauses, separable verbs, demonstrative and indefinite pronouns, interrogative adjectives, modal verbs, negation – adjective endings.

Essential Texts:
Deutsch Aktiv Neu 1.
Collins German Dictionary: German/English – English/German.

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7.3.1 MATHEMATICS
Hours/Week: Lecture 2.

Complex numbers, revision of basic concepts. Vector representation by complex numbers. De Moivre's Theorem. Uniformly rotating vector represented by $A.\exp(j\omega t)$.
Calculus. Derivatives of logarithmic and exponential functions. Further methods of integration. Application to selected electrical problems.
First order differential equations with application to RC and RL electrical circuits.
The Binominal Theorem. Expansion of $(1+X)^n$. Use of binomial series in approximations.
Series. Arithmetic and geometric progressions.
Introduction to the Fourier series expansion. Frequency spectrum.
Statistics. Methods of data classification. Frequency distributions. Sampling and quality control.

Recommended Text:
Bird, O.J. and May, A.J. Technician Mathematics.
Longman. 4th. Edition. 1990.

7.3.2 ELECTRIC CIRCUITS
Hours/Week: Lecture 2, Laboratory/Tutorial 2.

Use of j-operator in circuit analysis.
Power in AC circuits, power factor and loss angle, true power and apparant power, power factor correction. Single-phase power measurements.
Resonance in RLC series and parallel circuits, Q-factor, dynamic impedance. Selectivity and bandwidth.
Tuned coupled circuits, coefficient of coupling, reflected impedance, typical tuned R.F. and I.F. transformers.
Transmission lines at R.F., characteristic impedance. Travelling waves, matched and mismatched terminations, reflections and standing waves. The Smith Chart. Matching, short-circuited and open-circuited stub lines.
Filters: attenuation/frequency characteristics for low-pass, high-pass, band-pass and band-stop filters. Design of active filters using tables.

Recommended Text:
Boylestad, R.L. Introductory Circuit Analysis,
Merrill Publishing Co. 5th. Edition. 1990.

Additional Reading:
Floyd, T.C. Principles of Electric Circuits.
Merrill Publishing Co. 3rd. Edition. 1989
Walls, R. and Johnstone, W. D.C./A.C. Principles.
West Publishing Co. 1st. Edition. 1992.

7.3.3 ELECTRONIC CIRCUITS AND SYSTEMS (ANALOGUE)
Hours/Week: Lecture 3, Laboratory/Tutorial 2.

Equivalent circuits, small-signal analysis, voltage, current and power gain, input and output impedances. Multi-stage amplifiers. The differential amplifier.
Negative feedback: application of negative feedback to amplifiers. Effect of feedback on gain, input and output impedance and on frequency response. Stability considerations.
Operational amplifier parameters, open-loop gain, common-mode rejection, voltage and current offsets, bandwidth, slew-rate.
The difference amplifier, common-mode errors. The instrumentation amplifier, factors determining gain, offset errors and common-mode errors. Application in a data acquisition system.
Precision rectifiers, half-wave and full-wave, applications.
Logarithmic and inverse-logarithmic amplifiers, transfer characteristics, dynamic range, applications.

Recommended Text:
Fiore, J.M. Operational Amplifiers.
West Publishing Co. 1st. Edition. 1992.

Additional Reading:
Tocci, R.J. Fundamentals of Electronic Devices.
Merrill Publishing Co. 2nd. Edition. 1992.
Floyd, T.C. Fundamentals of Linear Circuits.
Merrill Publishing Co. 1st. Edition. 1992.

7.3.4 ELECTRONIC CIRCUITS AND SYSTEMS (DIGITAL)
Hours/Week: Lecture 2, Laboratory/Tutorial 2.

The cross-coupled NAND gate pair. The bistable (flip-flop) element. Truth table and timing diagrams. The asynchronous binary and decimal counters. The shift-register.
Edge-triggered Flip-flops, SR, D and JK types. Preset and clear inputs. Timing considerations: setup and hold times, propagation delay, maximum clock frequency.
The TTL gate, open collector, totem-pole, and tri-state output stages, loading rules, fan-out, noise immunity. Power dissipation.
The MOSFET gate, N-channel and P-channel devices. CMOS logic levels and noise margins. Power dissipation.
TTL-CMOS interface techniques.
Astable and monostable systems, waveform diagrams. TTL and CMOS clock circuits. Timer circuits.
Asynchronous and synchronous counters. Binary and BCD up-counter and down-counter, the presettable counter. The shift-register: right and left shift arrangements, serial in - parallel out and parallel in - serial out types.

Recommended Text:
Floyd, T.C. Digital Fundamentals.
McGraw Hill. 4th. Edition. 1990.

7.3.5 MICROPROCESSOR SYSTEMS
Hours/Week: Lecture 3, Laboratory/Tutorial 2.

The computer system: CPU, memory and input/output ports. CPU instructions, registers, ALU and control unit. Single and multi-byte instructions. Op-code and operand. Address data and control busses. Devices connected to the bus lines: tri-state and wired-OR.
Architecture of the 6800 microprocessor. 6800 dedicated and genral-purpose registers. 6800 instruction set. Addressing modes, immediate, direct and indirect. Effective address calculations using the index register. Relative addressing and position-independent code.
Static and dynamic RAM, internal architecture. CPU address decoding and memory map.
The input/output system. Memory-mapped and isolated I/O. Peripheral interface adaptors, initialization and programming. Handshake lines.
Interrupts. Programme control versus interrupt control. Hardware interrupts, interrupt vector and interrupt service routine.
Interrupts in a multiple peripheral environment. Enabling and disabling interrupts.

Recommended Text:
Brey, B.B. Microprocessors and Peripherals.
Merrill Publishing Co. 2nd. Edition. 1988.

Additional Reading:
Cluley, J.C. Introduction to Low Level Programming for Microprocessors. Macmillan. 1st. Edition. 1987.

7.3.6 COMMUNICATIONS ENGINEERING
Hours/Week: Lecture 3, Laboratory/Tutorial 2.

AM receivers.
The TRF receiver and its limitations.
The superhetrodyne receiver in block diagram form.
Adjacent channel and image channel interference.
Choice of IF frequencies.
The double superhetrodyne receiver in block diagram form.
RF amplifiers. Single and doubled tuned amplifiers.
Detection, the simple diode detector with AGC.
A.M. transmitters. Modulators, low-level and high-level transmitters in block diagram form.
Principles of frequency modulation, modulation index, spectrum diagram and bandwidth considerations.
Generation of a frequency modulated signal.
Block diagram of an F.M. superhetrodyne receiver.
The phase-locked loop in block diagram form.
F.M. demoulation using a phase-locked loop.
Sources of noise. Signal/noise ratio. Noise figure.
Receiver noise calculations.

Recommended Text:
Young, P. Electronic Communications Techniques.
Merrill Publishing Co. 2nd. Edition. 1990.

Additional Reading:
Schoenbech, R. Electronic Communications.
Merrill Publishing Co. 1st. Edition. 1988.
Guy, J.C. Data Communications for Engineers.
McMillian. 1st. Edition. 1992.

7.3.7 AVIONICS
Hours/Week: Lecture 2, Laboratory/Tutorial 4.

Power Conversion Equipment: Transformers and transformer rectifiers used in aircraft systems.
Frequency and phase conversion. Inverters.
Stabilization, filtering and transit protection.
Maintenance Procedures.
A.C. generators and systems. Principle and operation of A.C. Generators. A.C. Motors.
Description and operation of C.S.D. & I.D.G. and their interaction with other aircraft systems.
Voltage and frequency regulation. Control. Switching and protection.
Split and parallel A.C. systems, load sharing, typical aircraft systems.
Maintenance procedures.
Servos and synchros: Desynn.
Torque/Control/Differential synchros.
Control transformers. A.C. and D.C. servo systems.

Recommended Texts:
Pallett, E.H. Aircraft Electrical Systems.
Longman Scientific and Technical. 3rd Edition. 1987.
Powel, J. Aircraft Radio Systems.
Pitman. 1st Edition. 1981.

Reference Text:
Pallett, E.H. Automatic Flight Control.
Granada. 3rd Edition. 1987.

7.3.8 INDUSTRIAL AND COMMUNICATION STUDIES
Hours/Week: Lecture 1.

Writing Skills
This module will review the following aspects of the writing process:

— preparing to write.
— word choice, sentence and paragraph style and structure, and verb usage.
— common problems in grammar, punctuation and syntax.
— presentation of information in memoranda, letters and reports, including technical reports.

Information Search Methods

This module will consist of:
1. Introduction to library systems and services.
2. Modern Computerized Information Search and Retrieval Methods and including, for example, the use of the CD Rom facility.

Job Search Skills

1. This module will examine students' job-search strategies and help them determine career goals and identify specific skills and abilities.
2. The letter of Application and Curriculum Vitae will be reviewed.
3. Preparation for and attendance at, a job selection interview will be discussed and simulated in class.

Essential Text:
McClave, H. Communication for Business in Ireland.
Gill and McMillan, 1986.

7.3.9 EUROPEAN LANGUAGE
Hours/Week: Lecture 2.

7.3.9.1 FRENCH SEMESTER 3

Oral/Aural
Consolidation and expansion of oral skills by extension

to work-related contexts and situations. Students will be introduced to the registers of language and lexical items relating to background areas of relevance to their technical studies and to administrative formalities they are likely to face in working abroad.

Reading/Writing
Introduction to more formal letter writing, writing to companies, applying for positions, writing of Curicula Vitae, completion of forms and questionnaires, writing an English summary of technical texts.
Themes forming the basis for oral and reading/written work will include energy production, sources of energy, pollution, environmental problems, engineering schools and courses abroad, working abroad, job applications, tax and social security systems, electoral system, social and current affairs, public personalities.

Grammar
Acquisition and practice of more complex grammatical structures and lexical items.

Essential Texts:
Corless, Corless and Gaskell VECU : Signes du temps. Hodder and Stoughton 1991.
Collins French Dictionary French/English – English/French.

7.3.9.2 GERMAN SEMESTER 3

Oral/Aural
Communication in contexts such as hobbies, pastimes and interests, and contrasting relative merits of cars, equipment, comparing and talking about entertainment, locating places of interest, arranging an outing with friends, giving and receiving more complex direction.

Reading/Writing
Reading and written work continue to support dialogue-based topics; in addition, simple written texts will be used to introduce certain aspects of life such as industry, technical development, education system.

Grammar
Genitive case, comparative, superlative, interrogatives, subordinate clauses, imperfect tense, reflexive verbs.

Essential Texts:
Deutsch Aktiv Neu 1.
Collins German Dictionary: German/English – English/German.

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7.4.1 COMPUTING
Hours/Week: Laboratory/Tutorial 2.

This module is intended to introduce students to computer mathematical packages and their use in the solution of engineering problems. In particular the methods are used to aid the understanding of electric signals and circuit behaviour.
Spreadsheets: setting up a spreadsheet, entering and manipulating data, calculating with formulae, printing. Graphing data values.
Systems with 1st and 2nd order responses: solution of first and second order differential equations with constant coefficients and simple forcing functions by transfer function techniques. Basic introduction to the s-plane, poles and zeros. Applications to RL, RC and RLC circuits. The use of the DERIVE computer package to solve and plot the response of these circuits and to investigate the influence of damping on the response of 2nd order circuits.
Fourier Analysis: Fourier series of simple engineering periodic functions. Filtering effect of transmission through electrical networks. Use of the DERIVE computer package to illustrate these principles.
Statistics: Mean and standard deviation. Frequency distributions. Sampling and quality control. Use of the MINITAB computer package to illustrate the solution of statistical problems.

7.4.2 ELECTRIC CIRCUITS
Hours/Week: Lecture 2, Laboratory/Tutorial 2.

The transformer: voltage and current ratios, impedance matching. Phasor diagrams. Core materials, transformer losses. Transformer frequency response.
Measuring instruments: oscilloscope, digital multimeter, Q-meter, phase meter, frequency counters and timers.
Three-phase generation and transmission. Star and delta configurations. Phase and line voltages and currents. Balanced three-phase loads. Power in three-phase circuits. Three-phase rectifiers.
Electrical machines: energy conversion, efficiency. Principles and characteristics of D.C. machines. Speed control of D.C. machines. Principle and characteristics of stepper motors.
Principles and characteristics of A.C. machines: the induction machine, torque, and slip, factors determining speed. Characteristics of three-phase machines.

Recommended Text:
Boylestad, R.L. Introductory Circuit Analysis. Merrill Publishing Co. 5th. Edition. 1990.

Additional Reading:
Floyd, T.C. Principles of Electric Circuits. Merrill Publishing Co. 3rd Edition. 1989.
Walls, R. and Johnstone, W. D.C./A.C. Principles. West Publishing Co. 1st Edition. 1992.

7.4.3 ELECTRONIC CIRCUITS AND SYSTEMS (ANALOGUE)
Hours/Week: Lecture 2, Laboratory/Tutorial 2.

Amplifier steady-state frequency response. Bode diagrams. RC-type oscillators.
The function generator.
The silicon-controlled rectifier, diac and triac.
Linear regulators, current limiting arrangements.
Switched-mode regulators. The forward and flyback converter.
Test and measuring instruments, use of instruments for fault-finding in analogue circuits.
Grounding and screening problems.

Recommended Text:
Fiore, J.M. Operational Amplifiers. West Publishing Co. 1st. Edition. 1992.

Additional Reading:
Tocci, R.J. Fundamentals of Electronic Devices.
Merrill Publishing Co. 2nd. Edition. 1992.

7.4.4 ELECTRONIC CIRCUITS AND SYSTEMS (DIGITAL)
Hours/Week: Lecture 2, Laboratory/Tutorial 2.

Digital-analogue conversion. Converter specification, the data sheet parameters.
Analogue-digital converters. Successive approximation and dual-slope techniques. Converter specification, the data sheet parameters.
Random access memories: memory organization and addtessing methods. Static and dynamic RAM. Refresh requirements for dynamic RAM. Read-only memories: ROM, PROM and EPROM types.
Magnetic and optical storage.
Display devices, LED and liquid crystal elements. Methods of driving the display. Interfacing to TTL and CMOS elements.
Implementing logic systems using multiplexors, PAL devices.
Fault-finding methods for digital circuits and systems: use of the oscilloscope, logic analyser, logic probe and logic pulser. Technique of signature analysis.

Recommended Text:
Floyd, T.C. Digital Fundamentals.
McGraw Hill. 4th. Edition. 1990.

7.4.5 MICROPROCESSOR SYSTEMS
Hours/Week: Lecture 3, Laboratory/Tutorial 2.

Synchronous and asynchronous data transmission and reception.
Half and full duplex. Codes and protocols for asynchronous communication: ASCII, EIA-232-D. The 6850 Asynchronous Communications Interface Adapter (ACIA), initializing and programming.
Direct Memory Access (DMA). DMA facilities on the 6800 CPU.
Dynamic RAM: internal architecture. Methods for providing DRAM refresh. CPU timing diagrams for read and write operations using selected 6800 instructions.
Input and output devices. The VDU, character generation and display, brief overview of colour graphics displays.
The keyboard: keyboard encoding.
Printers: methods of interfacing and control.
Floppy and hard-disk storage. Disk formats. Disk controllers.
Microcomputer busses. The IEEE-488 instrumentation bus. Overview of local area networks, the Ethernet LAN.
Software development. Assembler and disassembler. The use of cross assembler, linker and loader. Introduction to operating systems, brief overview of DOS.

Recommended Text:
Brey, B.B. Microprocessors and Peripherals.
Merrill Publishing Co. 2nd. Edition. 1988.

Additional Reading:
Cluley, J.C. Introduction to Low Level Programming for Microprocessors. Macmillan. 1st Edition. 1987.

7.4.6 COMMUNICATIONS SYSTEMS
Hours/Week: Lecture 3, Laboratory/Tutorial 2.

The television signal. Simple treatment of TV receivers in block diagram form.
Digital communications. Analogue pulse modulation techniques. Pulse amplitude, pulse position and pulse width modulation. Pulse code modulation. Sampling, Quantizing, Companding. Companding standards. Multiplexing, types of multiplexing.
Communications coding; the need for coding, error control coding, parity check schemes.
Transmission codes, NRZ, RZ, Manchester, AMI.
Data communications. Block diagram of simple digital receiver. Common interfaces, modulation techniques, modems and standards.
Optical systems.
Introduction to propagation. Antenna systems.

Recommended Text:
Young, P. Electronic Communications Techniques.
Merrill Publishing Co. 2nd. Edition. 1990.

Additional Reading:
Schoenbech, R. Electronic Communications.
Merrill Publishing Co. 1st. Edition. 1988.
Guy, J.C. Data Communications for Engineers.
McMillian. 1st. Edition. 1992.
Miller, M. Introduction to Digital and Data Communications. West Publishing Co. 1st. Edition. 1992.

7.4.7 AVIONICS
Hours/Week: Lecture 2, Laboratory/Tutorial 4.

Introduction to instruments: Instrument layout. V.F.R. and I.F.R. Elements of an instrument. Lever and rod mechanisms.
Definitions. Standard. Sub-Standard. Secondary Standard.
Pitot static systems: Structure of the atmosphere. Barometers. Test Instruments.
Pitot and Static pressure. Sources of Pitot and Static pressure.
Components of pitot static systems and testing of such systems.
Pitot static instruments: Altimeter. VSI. Mach/ASI. Mach/Airspeed warning. CADC. Altitude Alert.
Temperature Measurement
Gyroscopes: Rigidity and precession. Real and apparent drift. Erection systems. Gyroscope errors.
Standby horizon. V.G. and D.G.
Rate of turn indicators
Compass: Terrestrial Magnetism. Direct reading compass. Compass errors. Remote Reading Compass. Compass swinging and compensation.
Engin instruments: Basic description of engine systems, RPM, E.G.T., E.P.R. and fuel/oil quantity.

Recommended Texts:
Pallett, E.H. Aircraft Electrical Systems.
Longman Scientific and Technical. 3rd Edition. 1987.
Powel, J. Aircraft Radio Systems.
Pitman. 1st Edition. 1981.

Reference Text:
Pallett, E.H. Automatic Flight Control.
Granada. 3rd Edition. 1987.

7.4.8 INDUSTRIAL AND COMMUNICATION STUDIES
Hours/Week: Lecture 1.

Structure of Irish Industry
This module will examine briefly the background to industrialisation in Ireland and will proceed to examine the more recent approaches to industrial strategy. Types of company, company structure, entrepreneurship, and the role of the various State and private organisations which promote the development of Irish companies, will be examined. E.C. Industrial Policy will also be discussed.

Legal Aspects of Employment
This module will review current employment legislation in Ireland and will cover topics such as workers' holidays, wages, minimum notice, dismissal, redundancy, discrimination, and health and safety. The increasing importance of European Community employment legislation will be examined.

Industrial Relations in Ireland
This module will study the system of industrial relations in Ireland, including a study of the role of the main institutions responsible for facilitating the investigation and resolution of industrial problems in Ireland.
Collective bargaining, grievance and arbitration procedures, and related issues will be studied. This module will also examine the Industrial Relations Act, 1990 and the Code of Practice on Dispute Procedures, 1992.

Role of Trade Unions
This module will examine the principal functions of the modern trade union movement in Ireland. The Industrial Relations Act, 1990, and its Trade Union legislation will also be examined.

Recommended Texts:
A Guide to Industrial Relations and Personnel Practices in Ireland. Federation of Irish Employers, 1992.
A guide to Employment Legislation in Ireland. Federation of Irish Employers, 1992.

7.4.9 EUROPEAN LANGUAGE
Hours/Week: Lecture 2.

7.4.9.1 FRENCH SEMESTER 4

Oral/Aural
Introduction to the more formal registers of the language relating to the technical areas of the course, e.g., describing from diagrams and illustrations, technical components, apparatus, equipment and the explanation of concepts.

Reading/Writing
Use of texts of a semi-technical nature, e.g., understanding written instructions for use in technical descriptions and abbreviations occurring in diagrams, drawings, tables and laboratory equipment.
Themes forming the basis for oral and reading/written work will include descriptions of equipment, electrical appliances, charts, tasks, professions, giving instructions on the use of equipment, developments in technology, social and current affairs.

Grammar
As for Semester 1.

Essential Texts:
Corless, Corless and Gaskell VECU : Signes du temps. Hodder and Stoughton 1991.
Collins French Dictionary French/English – English/French.

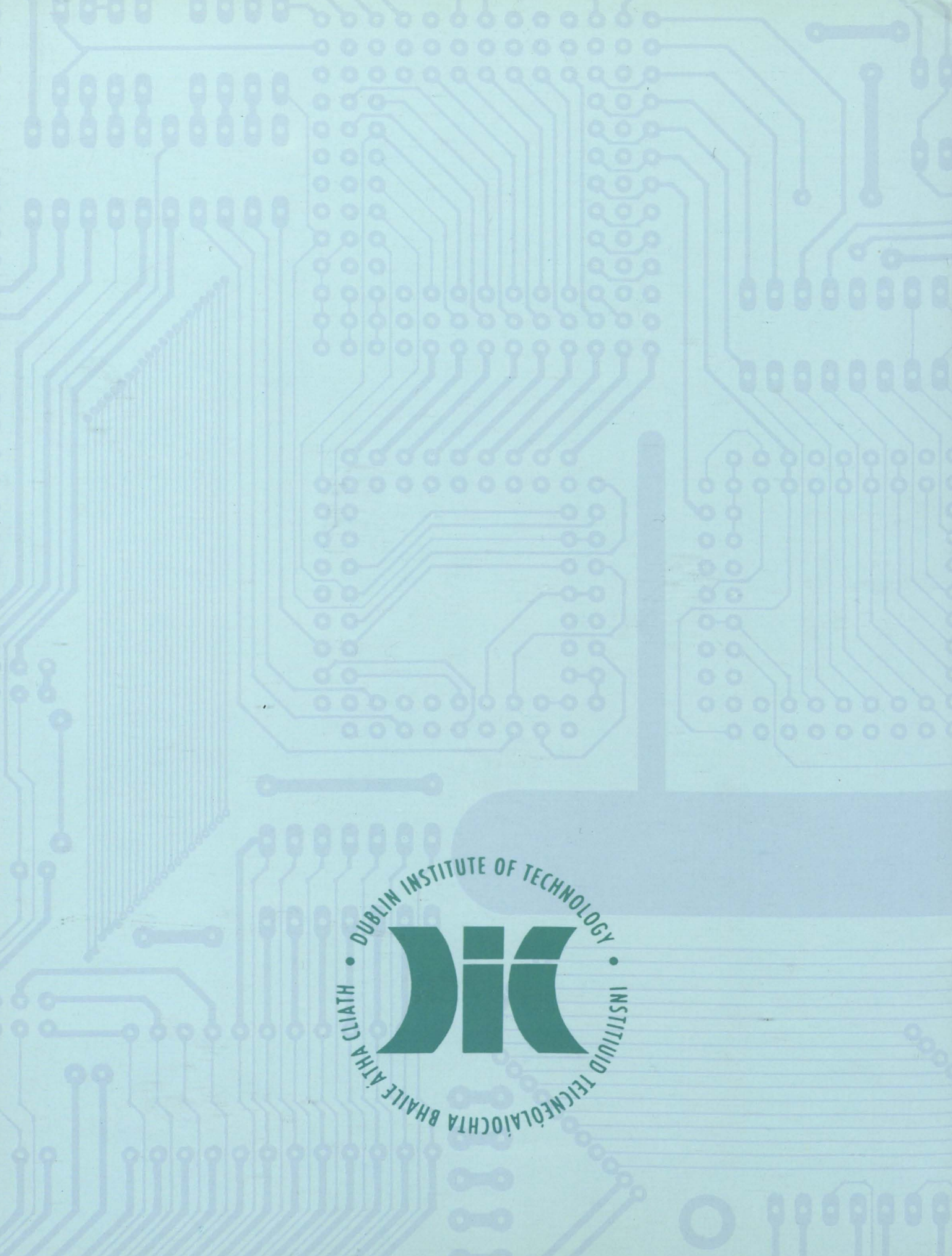
7.4.9.2 GERMAN SEMESTER 4

Oral/Aural
Communication in contexts such as accommodation possibilities, workplace, contact with officialdom, renting accommodation, understanding instructions in the workplace, arguing for student reductions/ entitlements, opening a bank account, more advanced postal/banking procedures, paying bills, arranging a medical appointment, obtaining medical attention.

Reading/Writing
Students will be taught the reading skills necessary to interpret written texts; materials used will include magazines, professional publications and newspaper items. Understanding job advertisements. Writing of simple letters. Writing of precis.

Grammar
Familiar forms of address, future tense, relative sentences, complex word order problems.

Essential Texts:
Deutsch Aktiv Neu 1.
Collins German Dictionary: German/English – English/German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