11. IE: Éire /Ireland

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11.1. General information

There are two main kinds of institutions in Ireland:
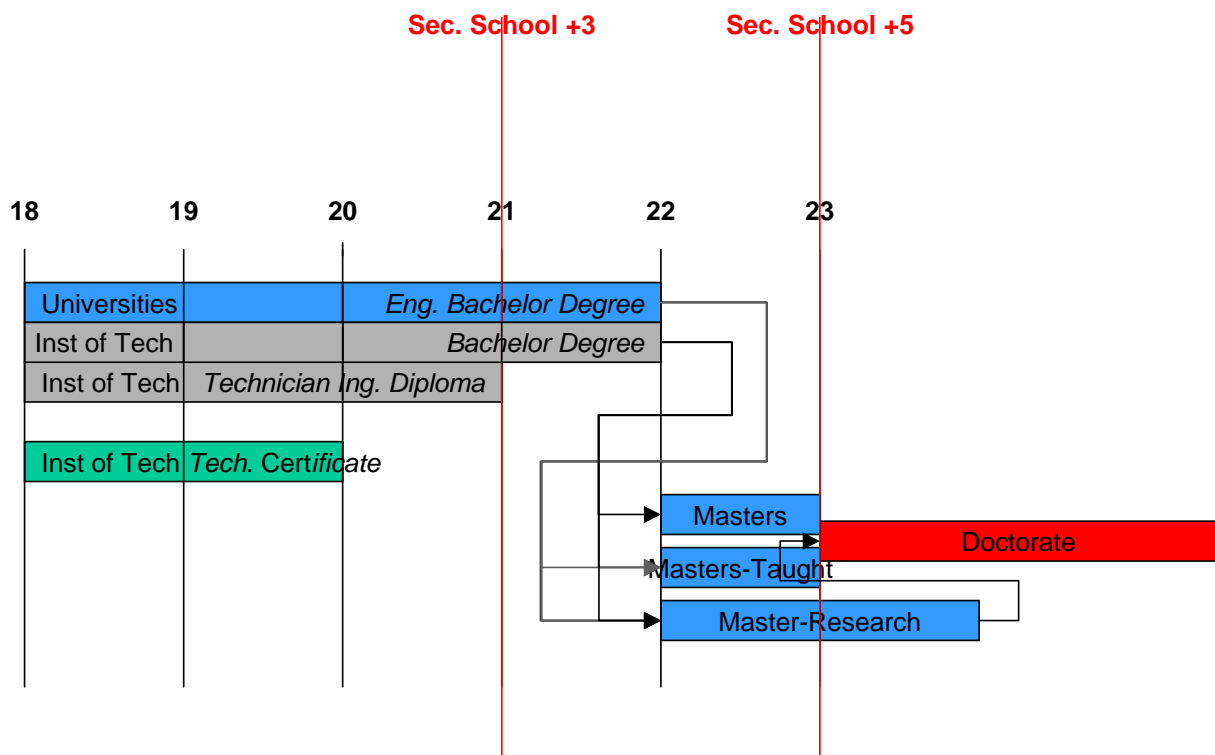
- Institutes of Technology,
- Universities.

Figure 11.1: Irish Higher Education System in EIE disciplines.

11.1.1 *Electrical and Information Engineering in Ireland, boundaries of the field of study*

Engineers Ireland covers all engineering disciplines and therefore there are no specific EIE "boundaries". Bachelor of Engineering programmes currently accredited in the EIE area include: Electrical Engineering, Electronic Engineering, Computer Engineering, Microelectronic Engineering, Telecommunications, Software and Information Systems Engineering.

11.1.2 *Content, degrees and accreditations*

Engineers Ireland has been designated as the national authority competent to regulate the engineering profession in the Republic of Ireland. This includes responsibility for evaluating the education and training of engineers and in fulfilment of this obligation the Institution formally accredits engineering degree programmes in Ireland.

Engineers Ireland do not review programmes for accreditation until after the programme produces its first cohort of graduates. Thus there are a number of other EIE related programmes, which have commenced in the past few years and which, though not accredited at present, are likely to be accredited at the appropriate time in the future.

In addition there are a number of other B.Eng., B.Sc. and B.Tech. programmes in the EIE area offered by the Universities and particularly by the Institutes of Technology, which for a variety of different reasons have not been submitted for accreditation to the IEI.

Engineers Ireland gives some guidelines in relation to core content, which should include:
  (i) Foundation Studies
    Mathematics, basic sciences, basic engineering sciences and technology, computer technology
  (ii) Engineering Studies
    Engineering sciences and technology appropriate to the engineering discipline. Analysis, modelling, measurement, design and testing techniques in an appropriate range of subjects. Opportunities for specialisation and selected advanced study.
  (iii) Complementary Studies
    Communications skills, languages, industrial, social and environmental aspects of engineering.

However, even with these guidelines, the Universities still have a lot of freedom in defining the content and structures of their own programme. Details of the contents of each of the programmes can be obtained from the individual Universities, all of whom also have their own websites.

11.1.3 *Implementation of the Bologna-BMD system in Ireland*

The current Irish University education system is based on a four year primary degree. Therefore the current systems is a 4-5-8 (or possibility 4-6-9) system. The Universities are funded by the Government and currently students taking primary degrees pay no fees and therefore changing the Irish system to a Bologna-BMD system presents problems.

Reducing the primary degree to three years will significantly reduce the level achieved by the graduates, which will have a negative knock-on effect for employers in business and industry. It would also require the Universities to redesign all of their existing programmes.

An alternative option is to increase the duration of the primary degree to 5 years, but this would have major funding implications for the Government and therefore is a decision that would require much prior discussion.

Engineers Ireland has reviewed the Bologna Declaration and its impact on Engineering education in Ireland and submitted its finding to the Government. Various other groups are still discussing the possible implications of moving towards the Bologna-BMD system.

Meanwhile all the Universities and Institutes of Technology have adopted the ECTS credit system and all the programmes and individual modules have been assigned the appropriate ECTS credit weighting.

11.2. Figures on the weight of EIE in Ireland

Student number figures for the Irish Universities for the Academic Year 2005/2006 showed that 2959 students (4.6%) out of a total of 64,765 students were studying EIE related programmes.

11.3. Qualifications in EIE in Ireland

The National Qualifications Authority of Ireland developed the Irish National Framework of Qualifications in 2003. This is a ten level framework, which captures all the learning from the very initial stages to the most advanced. Qualification achieved in school, further education and training and higher education are all included in the framework. Sixteen major award- types have been established of which eight are higher education award-types:

- The Higher Certificate at level 6
- The Ordinary Bachelor Degree at level 7
- The Honours Bachelor Degree at level 8
- The Higher Diploma at level 8
- The Masters Degree at level 9
- The Post-Graduate Diploma at level 9
- The Doctoral Degree at level 10
- The Higher Doctoral Degree at level 10

Each of these eight award-types has a descriptor associated with it which describes the purpose, level, volume, learning outcomes, progression and transfer and articulation associated with it.

Honours Degree programmes (level 8) in Ireland are in general of four years duration. Students enter these programmes immediately after completing second level education at approximately 18 years of age. These programmes are offered by the Universities and in some cases by the Institutes of Technology.

Two and Three year programmes are also offered by the Institutes of Technology and other Third Level Colleges. These programmes include two year Higher Certificate programmes (level 6)(Technician Engineer level) and three year Ordinary Degree programmes (level 7)(Associate Engineer level) In some cases it is possible to progress from these programmes to Honours Degree programmes.

Taught Masters programmes (level 9), of one or two years duration, in a range of different subjects, are offered by most of the Universities. A Masters Degree can also be obtained by research and thesis (this typically takes 18 months to 2 years). Ph.D. degrees (level 10), which typically take a minimum of three years, are offered by all the Universities.

11.3.1 *Sub Honours Bachelor Degree Level*

In Ireland at Sub Honours Bachelor Degree level, there are two recognised qualifications, a Higher Certificate (level 6) and an Ordinary Degree (level 7).

(a) A Higher Certificate in Engineering is a two-year '*ab initio*' programme. The student effort required should be such as to merit 120 ECTS credits. On completion, the graduate is referred to as an Engineering Technician and should be competent to apply in a responsible manner proven techniques which are commonly understood by those who are expert in a branch of engineering or those techniques specially prescribed by professional engineers. He/she works under guidance within their allocated responsibility. National Certificate programmes are generally offered by the Institutes of Technology and programmes related to EIE currently on offer (see Section 11.1.1) include:

Electronics –
(Electronics 38%, maths 14%, telecommunications 7%, computers 8%, science 6%, technology 7%, projects and labs 8% and complementary studies 12%).

Electronic and Computer Engineering –
(Electronics 25%, maths 14%, computers 34%, telecommunications 5%, science 3%, technology 7%, projects and labs 7% and complementary studies 5%).

Electronics and Communications –
(Electronics 29%, maths 13%, computers 15%, telecommunications 18%, science 4%, technology 10%, projects and labs 7% and complementary studies 4%).

(b) An Ordinary Degree in Engineering is a three-year '*ab initio*' programme or a one year post Higher Certificate programme. The total student effort required should be such to merit 180 ECTS credits. On completion the graduate is referred to as an Associate Engineer and should be competent to apply in a responsible manner current engineering technologies in a chosen field. He/she exercises independent technical judgement and works with significant autonomy within his/her allocated responsibility. Ordinary Degree programmes are generally offered by the Institutes of Technology and programmes currently on offer, related to EIE (Section 11.1.1) include:

Electronic Engineering –
(Electronics 37%, maths 14%, telecommunications 6%, computers 12%, science 4%, technology 6%, project and labs 11% and complementary studies 10%).

Computer Engineering **–**
(Electronics 20%, computers 38%, maths 14%. Science 4%, technology 6%, project and labs 10%, and complementary studies 8%).

Mechatronics –
(Maths 17%, electronics 21%, mechatronics 9%, computers 12%, science 9%, manufacturing 23%, project 9% and complementary studies 2%).

11.3.2 *Honours Bachelor Level*

The following is the current list of Engineers Ireland accredited programmes in EIE:

- B.Eng Electronic Engineering (Cork IT, Dublin City University, University of Dublin, University of Limerick, NUI Galway, University College Dublin, IT Tallaght, NUI Maynooth)
- B.Eng Electrical/Electronic Engineering (Dublin IT, University College Cork, University College Dublin, IT Tallaght)
- B.Eng Electronic and Computer Engineering (University of Dublin, NUI Galway)
- B.Eng. Computer Engineering (University of Dublin, University of Limerick, DIT, NUI Maynooth)
- B.Eng. Information and communications Engineering (Dublin City University, NUI Maynooth)
- B.Sc. Computer Science (Dublin City University, University of Dublin, University of Limerick)
- B.Sc. Information Technology (NUI Galway, University of Limerick)

Course content:

Electronic Engineering –

(Maths 16%, science 5%, electronics 37%, computers 12%, telecommunications 10%, project 10% and complementary studies 10%).

Electrical/Electronic Engineering –

(Maths 12%, science 3%, electronics 38%, computers 11%, telecommunications 9%, mechanical 6%, project and design 10% and complementary studies 7%).

Electronic and Computer Engineering –

(Maths 16%, science 3%, electronics 6%, software 27%, computer systems 23%, project 10% and complementary studies 15%).

Computer Engineering –

(Maths 11%, science 5%, electronics 22%, software 15%, computer systems 18%, telecommunications 7% project 10% and complementary studies 12%).

Information and communications Engineering –

(Maths 12%, electronics 28%, telecommunications 23%, computers 20%, science 4%, project 10% and complementary studies 3%).

Computer Science/Info Technology –

(Maths 16%, software 20%, computer systems 18%, electronics 7%, science 3%, business 6%, telecommunications 8%, project 10% and complementary studies 12%).

Note – the individual Universities have the freedom to define and modify their own programmes and therefore the content percentages quoted above vary between the different Universities and also over time.

11.3.3 Intermediate level, between honours bachelor and master

In Ireland there is no formal level of qualification between the Honours Bachelors Degree and the Masters Degree. However, many of the Universities offer Higher Diploma or Graduate Diploma programmes. These are generally of one year's duration (60 ECTS credits) and tend to be at degree level for graduates who already hold a degree in a related discipline. Therefore they are sometimes referred to as conversion programmes or double degrees. They also tend to be quite specialised with the title accurately reflecting the content and are usually unique to the University offering the programme.

The following is a list of the EIE related Higher/Graduate Diplomas currently on offer :
    Higher Diploma in Microelectronics;
    Higher Diploma in Integrated Circuit Design – University College Cork;
    Graduate Diploma in Electronic Systems/Telecommunications Engineering – Dublin City University;
    Graduate Diploma in Software Engineering – University College Dublin;
    Graduate Diploma in Software Localisation – University;
    Graduate Diploma in Computer Engineering – University of Limerick;
    Graduate Diploma in Computing – University of Limerick;
    Higher Diploma in Information Technology – NUI Maynooth.

The individual Universities have the freedom to define and modify the contents of their programmes as opportunities arise and trends change.

11.3.4 Master Level

Masters Degrees can be obtained either by Research and Thesis or by means of a taught programme and typically takes one to two years. A wide range of research topics, which relate to the research interests of the faculty and ongoing research projects are available at each of the Universities.
Similarly the Taught Masters programmes tend to reflect the research strengths of the University offering the programme and therefore they tend to be quite specialized in their content.

The following is a list of the EIE related Masters programmes currently on offer at the Irish Universities:
    Microelectronic Engineering – University College Cork;
    Electronic Systems/Telecommunications Engineering – Dublin City University;
    Networks and Distributed Systems – Trinity College Dublin;
    Integrated Systems Design - Trinity College Dublin;
    Multimedia Systems – Trinity College Dublin;
    Computer Engineering – University of Limerick;

Computer and Communications Systems – University of Limerick;

VLSI Systems – University of Limerick;

Interactive Media – University of Limerick;

Software Engineering – NUI Maynooth, Athlone Institute of Technology;

Electronic Engineering – NUI Maynooth;

Information Technology – NUI Galway;

Software Design and Development – NUI Galway;

Software Engineering – University of Limerick, University College Dublin.

The individual Universities have the freedom to introduce new programmes or to modify existing programmes as opportunities arise and trends change.

11.3.5 *Doctorate Level*

The Doctorate or Ph.D. degree is the highest-level degree normally awarded by the Universities in Ireland. It is typically taken after the Masters degree and generally is of three years duration. In the EIE disciplines it is always taken by research and thesis and as with the Research Masters a wide range of research topics, which related to the research interests of the faculty and ongoing projects are available at each of the Universities.

11.4. References

The information given in this monograph is based on the following documents and web links:

• Engineers Ireland, which is the professional engineering body in Ireland. The web address is http://www.engineersireland.ie/.

Doctoral
Studies

11.5. Doctoral Studies in Ireland

11.5.1. Supervision

Scientific Board or Supervisor

Supervisor - same personal supervisor for the student's thesis work on an active/new research area of the department or the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

Who can be a Supervisor

1.   Any professor/lecturer in the department.

2.   Internal or external researchers can be co-supervisors.

Tasks of Scientific Board/Supervisor

1.   General management/monitoring   YES

2.   Deciding/advising layout of course   NA

3.   Assigning a thesis subject   YES

4.   Responsible for monitoring student's progress. YES

Duration

Four years (typically), but usually with a minimum of three years.

11.5.2. Development

Courseware?

No. However the concept of a structured PhD programme, which will include coursework is currently being considered.

Course Work

1. The students don't have to take course work during their doctoral degree preparation. However, short training and induction programs for research students are usually provided. In addition where the student has a deficiency in a specific area some additional coursework might be prescribed.

2. Extension: not relevant.

3. Credit system: not relevant.

4. Monitoring: not relevant.

Contribution to Teaching

1. Supervision of undergraduate laboratory work (typically 4/6 hours per week).

2. In general, no teaching of undergraduate courses.

Presentation of Work

1. In the department.

2. At national conferences (actively encouraged).

3. At international conferences (dictated by availability of funding).

11.5.3. Thesis Work

Submission of Doctoral Written Thesis

1.   Language normally used: English. Alternative languages: Irish or other. Alternative language is subject to availability by faculty.

2.   No credits allocated to the doctoral thesis.

3.   The doctoral thesis is a previously unpublished substantial written report.

4.   The possibility of the acceptance of a bound collection of previously published articles with an introduction and commentary is being considered.

Oral Presentation of Thesis Work

1.   Language normally used: English. Alternative languages are possible, but subject to availability by the faculty.

2.   Oral presentation to interested staff and/or a closed audience. There is an oral examination with only student and examiners present.

3.   Duration: typical duration of 3 hours with no upper time limit.

11.5.4. Examination

Thesis Examination Board

1.   Composition: one internal examiner, one external examiner, the Chair, supervisor and possible Assistant Dean (4 or 5 members).

2.   Selection in consultation with the Head of Department, Assistant Dean and Dean.

3.   Decision ratified by the Examination Board and the Academic Council.

Evaluation

1.   Result based on the reading of the thesis and the oral presentation of the thesis work, with n grading system for the doctoral degree.

2.   Possible outcomes: *(i) Award degree with no corrections needed; (ii) Award degree subject to minor corrections usually verified by internal examiner; (iii) Refer back to student for major corrections examined by internal and external examiners, oral at their discretion; (iv) Reject, but allow student do additional work and resubmit thesis within 12 months with full thesis and oral examination; (v) Reject.*

11.6. Questionnaires

Ireland

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	Superv. only
3.1.2	**How many members are in the Scientific Board?**	NA
3.1.3	How are the members of the Scientific Board chosen?	**NA**
3.1.3.1	Elected by the Faculty, Department?	NA
3.1.3.2	Chosen by the student?	NA
3.1.3.3	Chosen in another way? Please specify:	NA

(Additional note: if the supervisor is an active member of specific research project or centre, other members of the project team may contribute to the supervision.)

3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	YES
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	NA
3.1.4.4	Assigning the thesis subject.	YES
3.1.4.5	Other. Please specify:	

(Additional note: if the project is such that a supervisory team is involved, then the responsibility of the team would be to ensure the quality and rigour of the supervision process and the quality of the student experience.)

3.1.5	Does the student need a personal supervisor during her/his studies?	YES
3.1.5.1	Does the same person supervise her/his thesis work?	YES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.6 Must the subject of the doctoral thesis be an active research area in the department?   YES

(Additional note: it may on occasions be a new research area, but one in which the supervisor would have expertise.)

3.1.7 The doctoral thesis subject is normally assigned:

3.1.7.1 At the beginning of the doctoral studies?   YES

3.1.7.2 After a specified period of coursework?   NA

3.1.7.3 Other. Please specify:

3.1.8 The thesis supervisor of a doctoral student can be:

3.1.8.1 Any professor or lecturer in the department?   YES[1]

3.1.8.2 Any researcher in the department?   YES[2]

3.1.8.2.1 In this case, is there a need for a second supervisor who is a professor or lecturer in the department?   YES[3]

3.1.8.3 Any researcher in another institution?   YES[4]

3.1.8.3.1 In the latter case, is there a need for an internal supervisor?   YES[5]

3.1.8.4 Other methods. Please specify:

[1] (though must have a PhD themselves); [2] YES, but usually as a co-supervisor; [3] YES, but usually as the principal supervisor; [4] YES, but as 3.1.8.2. above; [5] YES, but see 3.1.8.2.1 above.

3.1.9 The thesis subject is assigned by:

3.1.9.1 Agreement between the student and the proposed supervisor?   YES

3.1.9.2 Other methods. Please specify:

3.2- COURSE WORK

3.2.1 Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3. NO

3.2.2 **Extension and assessment.**

3.2.2.1 What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
hrs	**hrs**	**hrs**	**hrs**

3.2.2.2 **In which form is this coursework offered?**

- As specialist graduate course units.

- As course units taken from the undergraduate programme.

- Other. Please specify.

3.2.2.3 Is the coursework assessed by examinations?
If not, please give details:

3.2.3 **Credit system**

3.2.3.1 Is the coursework in your institution described by a credit system?

3.2.3.2 Is it the ECTS system?

If not, what is the relationship with ECTS?

3.2.3.3 How many credits are allocated to coursework? credits

3.2.4 **Monitoring**

3.2.4.1 Do you monitor the performance of the doctoral student taking coursework?

3.2.4.2 **What regulations apply in case of failure in one or more course units?**

- Retake the exam.

- Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.

YES

3.3.2   At national conferences.

YES[6]

3.3.3   At international conferences.

YES[7]

[6] YES – actively encouraged. [7] YES – if feasible, but usually dictated but availability of funding.

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.

YES[8]

3.4.2   Teaching undergraduate courses.

NO[9]

[8] YES, typically 4/6 hours per week. [9] NO, in general, but may in exceptional circumstances.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1   Which language is normally used for the thesis?

English

4.1.2   Are alternative languages used for the thesis?
Please Specify:

YES

IRISH or another language, subject to availability of faculty with competence in the language concerned.

4.1.3   Which language is normally used for the oral presentation and/or examination?

English

4.1.4   Are alternative languages used in the oral presentation and examination? Please Specify:

NO

NO in general, but see 4.1.2. above.

4.1.5   Are credits allocated to the doctoral thesis?

NO

4.1.6   **The doctoral thesis is:**

4.1.6.1   A previously unpublished substantial written report.

YES

4.1.6.2   A collection of individual or co-authored scientific papers with an introduction and/or commentary.

NO[10]

4.1.6.3   Other. Please specify:

[10] NO, at present, but being considered.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1   Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?   NO
NO – closed audience.

4.2.2   Composition of the thesis examination board. Please, give the typical number of:

4.2.2.1   Internal examiners.   1

4.2.2.2   External examiners. 1^{11}

4.2.2.3   TOTAL.   4 or 5

[11] Internal examiners: one; external examiners: one plus Chair, supervisor and possible, Assistant Dean, Research for the Faculty.

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.   NO

4.2.3.2   By the scientific committee of the institution.   NO

4.2.3.3   By the rector or equivalent.   NO

4.2.3.4   By the national ministry.   NO

4.2.3.5   Other. Please specify:

In consultation with the Head of Department, Assistant Dean, Dean.

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis. YES^{12}

4.2.4.2   The oral presentation of the thesis work. YES^{12}

4.2.4.3   Both.

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?   3 hours[13]

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   NO

[12]**YES, both. **[13]** Variable, typically 3 hours.**

4.2.5   Is the oral part of the examination taken behind closed doors?   YES

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.   See **below**

4.2.6.2   May resubmit revised thesis.   See **below**

4.2.6.3   May do further work as specified by examination board.   See **below**

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur? Please specify: See **below**

The Following are the possible outcomes of the PhD Examination:
(i) Award degree with no corrections needed.
(ii) Award degree subject to minor corrections being carried out
(Usually verified by internal examiner).
(iii) Refer back to student for major corrections (usually a major rewrite of thesis).
(Examined by internal and external examiners, oral at their discretion).
(iv) Reject, but allow student do additional work and resubmit thesis (within 12 months). Full thesis and oral examination.
(v) Reject.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?   NO

IE: Éire /Ireland

Universities

Town	Name	http address
Cork	University College Cork	http://www.ucc.ie
Dublin	Dublin City University	http://www.dcu.ie
	University College Dublin	http://www.ucd.ie
	University of Dublin, Trinity College	http://www.tcd.ie
Galway	National University of Ireland, Galway	http://www.nuigalway.ie
Limerick	University of Limerick	http://www.ul.ie
Maynooth	National University of Ireland, Maynooth	http://www.may.ie

Institutes of Technology

Town	Name	http address
Athlone	Athlone Institute of Technology	http://www.ait.ie
Carlow	Institute of Technology Carlow	http://www.itcarlow.ie
Cork	Cork Institute of Technology	http://www.cit.ie
Dublin	Dublin Institute of Technology	http://www.dit.ie
Dundalk	Dundalk Institute of Technology	http://www.dkit.ie
Galway-Mayo	Galway-Mayo Institute of Technology	http://www.gmit.ie
Letterkenny	Letterkenny Institute of Technology	http://www.lyit.ie
Limerick	Limerick Institute of Technology	http://www.lit.ie
Sligo	Institute of Technology Sligo	http://www.itsligo.ie
Tallaght	Institute of Technology Tallaght	http://www.it-tallaght.ie
Tralee	Institute of Technology Tralee	http://www.ittralee.ie
Waterford	Waterford Institute of Technology	http://www.wit.ie
Dublin	Institute of Technology Blanchardson	http://www.itb.ie