University College Dublin
National University of Ireland, Dublin

Radiography

Session 2002/2003

Note

Where the tuition in a subject is completed in the first semester, the University Examination in that subject may be held during the prescribed period at the end of the semester. Supplemental examinations, if required, will take place in the Autumn.

Contents

Degree of Bachelor of Science (Radiography)

Introductory Information

The full-time degree course leads to the examination for the Degree of Bachelor of Science (Radiography) of the National University of Ireland and to professional recognition by the Irish Institute of Radiography. The degree is internationally recognised for the practise of Radiography.

Application and Admission
In session 2002/2003 not more than twenty five places will be available in the first year. Admission is competitive and is based on the points system for students taking Leaving Certificate examinations.

Information on the application procedure may be obtained from the Central Applications Office, Tower House, Eglinton Street, Galway, (telephone: 091 509 800). Information on admission requirements may be obtained from the Admissions Office, University College Dublin, Belfield, Dublin 4 (telephone: 01 716 1425).

Note: Prospective students must have a laboratory science subject, and either Physics or Chemistry is recommended.

Prospective students are strongly advised to spend some time in an X-ray department before completing the CAO form. Experience gained in an X-ray department will be of great benefit to candidates considering Radiography as a career.

Induction
Advisory meetings are held in the week before term begins. Attendance is obligatory for first year students. Details are forwarded to students early in autumn.

Fees
Additional expenses arise from uniforms, books, and travel to clinical centres and costs associated with the professional recognition of the Irish Institute of Radiography.

Hepatitis B Vaccination:
In line with currently accepted policies for health care workers, Hepatitis B vaccination is arranged for all undergraduate radiographers at the commencement of the course.

Dates of the Academic Session 2002/2003
The dates of the academic session 2002/2003 for Radiography students are as follows:

First Semester:	
(Michaelmas term)	16th September 2002 – 6th December 2002
Second Semester:	
(Hilary/Trinity terms) *	6th January 2003 – 17th April 2003

* Dates of mid-term break vary depending on year of the course.

Note: Clinical instruction and hospital placements continue beyond the above dates in all four years of the course. In years one to three, summer clinical placements are from mid May until mid July. The length of the summer recess is thus approximately eight weeks.

Attendance at lectures and clinicals
Students attend lectures in the School of Diagnostic Imaging, Earlsfort Terrace Medical School and Belfield. Clinical experience within the course is undertaken mainly in St. Vincent's, the Mater Misericordiae, Beaumont and Tallaght Hospitals, as well as in other Dublin hospitals.

Summary of Courses and Examination Subjects

First Year

Anatomy I
Biochemistry
Chemistry
Functional Histology and Physiology I
Physics
Psychology I
Radiography I
Clinical Skills I
First Aid
Equipment*
Hospital Studies*
Imaging Technology*

* These subjects are not presented for examination

Second Year

Anatomy II
Equipment I
Hospital Studies
Imaging Technology I
Interpersonal Skills
Healthcare Informatics
Medical Sociology
Functional histology and Physiology II
Radiography II
Radiation and Dosimetry
Clinical Skills II

Third Year

Diagnostic Imaging I:

Radiography
Ultrasound
Radionuclide Imaging

Digital Imaging I
Epidemiology, Statistics and Research Methods
Equipment II
Imaging Technology II
Management and Health Service Structure
Mechanisms of Disease
Clinical Skills III

Fourth Year

Diagnostic Imaging II:

Radiography
Computed Tomography
Magnetic Resonance Imaging

Digital Imaging II
Legal Medicine
Systematic Pathology
Research Project
Clinical Skills IV

Regulations

Students must abide by the Student Code and University Regulations as presented in the Student Information Handbook.

Attendance at Courses
Students proceeding to the Degree of Bachelor of Science in Radiography must satisfactorily attend courses for four years and pass each year's examination.

Clinical placements are an elemental part of each year's course and full attendance is mandatory. Unless there are extenuating circumstances, students will be required to make up clinical non-attendance before presenting for Clinical Assessment, or progressing to the next course year. Students taking repeat examinations may be required to repeat clinical placements from the previous academic session.

Examinations
Most examinations are held in the summer of each year of the course. Supplemental examinations (if required) will be held in the autumn. Where a course of study is delivered completely in the first semester, examinations are normally held in the winter examination period, with repeat examinations (if required) in the following autumn.

Candidates for admission to any examination must have satisfactorily attended the prescribed course of instruction. A candidate must have satisfactory attendance at all clinical placements before presenting for assessment of clinical skills. All examinations must be passed as a whole before proceeding to the course of the following year. Students who do not pass an examination may be required to re-attend the respective courses in the following session before re-entering for the examination. A proportion of marks in some subjects may be allocated to the year's work.

The University Examinations of the first and second year of Radiography must be passed within two years of entering the respective year.

The Degree will be awarded on the basis of the results of the Third University Examination in Radiography and the Final University Examination in Radiography.

Syllabus of Courses

First Year

Anatomy I **(ANAT 1003)**

Lectures, dissection and applied anatomy/functional anatomy tutorials during semesters I and II.

The course in Anatomy is continued over the first and second year. The topics covered are: osteology and arthrology; myology; anatomy of the limbs and thorax; surface and functional anatomy on the living model; abdomen, pelvis and perineum; nervous system; anatomy of the head and neck; embryological development of the human with emphasis on the risks of radiation.

Chemistry **(CHEM 1605)**

Lectures and practicals during semesters I and II

The elements; their electronic structures and properties. Ionic and covalent bonding. Water, solutions and colloids, dialysis. Acids, bases and ionic compounds, including buffers. Structures and properties of important organic compounds, including hydrocarbons, alcohol, amines, carboxylic acids, amides, amino acids, peptides. Topics of special relevance to radiography focusing on radiochemistry, the chemistry of photographic processes and contrast agents.

Biochemistry **(BIOC 1601)**

Lectures: Twenty hours during the second semester.

Cell Biology and Biochemistry. The building blocks of the cell – proteins, lipids and carbohydrates. Structure and function of enzymes. Structure and function of biological membranes

DNA and RNA, molecules of heredity. Heredity and the cell. The structure of nucleic acids. RNA directed protein synthesis. Hereditary diseases and genetic engineering.

Generation and storage of metabolic energy. Glycolysis. Glycogen, Gluconeogenesis and Glucose homeostasis. Storage and mobilisation of lipids. Oxidation of fatty acids.

Metabolism of nitrogenous compounds: aspects of nutrition. Synthesis and catabolism of amino acids. Nitrogen balance and protein requirements. Formation of urea. Vitamins.

Experimental Physics **(EXPH 1604)**

Lectures and laboratory sessions during semesters I and II.

Mechanics, atomic theory of matter, wave phenomena, light and sound, thermal physics, electricity and magnetism, X-rays, nuclear physics, properties of fluid and matter, current electricity.

Physiology I **(PHYS 1003)**

Lectures and practical classes during semesters I and II

The course in Physiology over the first year is designed to give the student an in-depth knowledge of fundamental reactions of living organisms, particularly in the human body. The major topics covered include the following: the cell; primary tissue; connective tissue; skin; muscle; nervous tissue; blood; lymphoid tissues.

Laboratory classes are concerned with the microscopic structure of tissues, organs and systems and particular emphasis is placed on relationship of structure and function.

Radiography I **(RDGY 1001)**

Lectures and practical classes during semesters I and II.

Terminology. Role of the radiographer. Principles of radiation protection. Principles of exposure factor selection. Image quality and appraisal.

Radiographic techniques of the following: Upper limb; lower limb; thorax and shoulder girdle; pelvic girdle; vertebral column; respiratory system; simple consideration of abdominal and pelvic contents; macro radiography.

Psychology **(RDGY 1002)**

Lectures in semester I and semester II

This section of the course is designed to give a basic knowledge of the psychological function of man in health and disease, and to outline the processes of interaction between organism and environment. The main subjects for study will be: perception, learning, emotion and motivation, measurement and individual differences, personality, social psychology.

Equipment

Short course in semester I

A simple introduction, relating theoretical physics to radiographic practice and covering terminology, various pieces of X-ray equipment and current legislation governing its use.

First Aid

Short course in semester II

Recognition, resuscitation and stabilisation of the injured patient, with emphasis on the development of practical skills.

Hospital Studies

Short course in semester I

Departmental protocols and aspects of practice. Hygiene in the hospital. Ergonomics. Overview of health and safety.

Imaging Technology

The first year course is intended to give the undergraduate an introductory overview of: Photographic principles, film materials, intensifying screens, film cassettes, principles of processing, image quality and image perception.

Clinical Skills I
Students will attend hospital departments throughout the year, and will undertake general radiographic examinations under the supervision of clinical staff. All clinical placements are organised and scheduled by School staff.

Throughout the course, the attendance of students for clinical experience in the general and specialist hospitals affiliated to the University must be certified by School staff before the student may proceed to the relevant examinations.

Second Year

Anatomy II **(ANAT 2003)**
Lectures, dissection and applied anatomy/functional anatomy tutorials during semesters I and II.
See First Year Curriculum.

Imaging Technology I **(RDGY 2001)**
Lectures and practical classes during semesters I and II.
Photographic principles. Sensitometry. Film materials. Intensifying screens. Cassettes. Storage of photographic materials. Dry processing techniques. The radiographic image. Principles and practice of processing. Silver conservation and recovery. Automated film handling. Film presentation and archival.

Physiology II **(PHYS 2003)**
Lectures and practical classes during semesters I and II
The course in Physiology over the second year is designed to continue on from the course in first year giving the student an in-depth knowledge of fundamental reactions of living organisms, particularly in the human body. The major topics covered include the following: respiration; blood vessels; circulation; cardiac cycle; systemic circulation; sensory receptors; special senses; motor unit; spinal cord; control of movement; hypothalamic functions; gastro-intestinal tract; kidneys; uterus; urinary tract; pregnancy; endocrine system.

Practical classes in the first semester include respiratory function tests, electromyography and exercise. Histology classes in the second semester are concerned with the microscopic structure of tissues, organs and systems and particular emphasis is placed on relationship of structure and function.

Radiography II **(RDGY 2002)**
Lectures and practical classes during semesters I and II.
Manipulation of exposure factors and image quality. Radiographic examinations to cover: Skull. Dentition and orthodontic practice; abdominal and pelvic contents, foreign body localisation; gastro-intestinal tract; urinary system; lacrimal system; salivary system. Conventional tomography.

Equipment I **(RDGY 2003)**

Lectures and practicals in semester I and II

The X-ray tube. AC supply. Circuitry for X-ray generation. Generators. Microprocessor control. Control and destabilisation equipment. Physics of X-ray generators, tubes and intensifiers, Quality assurance and Quality control.

Radiation and Dosimetry **(RDGY 2004)**

Lectures in semester I and II

Electromagnetic radiation. Interaction with matter. Radiation detection. Dosimetry. Biological effects of radiation. Radiation protection.

Healthcare Informatics **(HCIN 1002)**

Lectures: 24 hours; Practicals: 54 hours

Basics of computer technology; computer architecture; hardware and software; operating systems. Information systems; database; knowledge-based systems. Communications and networks. Applications of computing in medicine. Generic software packages. Laboratory: Practical exercises designed to develop familiarity with generic software packages.

Hospital Studies **(RDGY 2005)**

Lectures in semester I and II

Health and safety. Patients with special needs. Trauma immobilisation. General observations of the patient. Principles of nursing care. Surgical procedures. Critical care. Infection control. Pharmacology. Contrast agents, Applied pharmacology, storage, stock control and disposal.

Interpersonal Skills **(RDGY 2006)**

Lectures in semester II

Effective communication. Related factors. Initiating and responding skills. Counselling and communication.

Medical Sociology **(SOC 2701)**

Lectures in semester I

Distribution of health and illness in society. The roles and settings of medical practice. Public Health Policy. Social impact of advances in medical technology.

Clinical Skills II **(RDGY 2007)**

Students will attend a range of hospital departments throughout the year, and will undertake general and more specialised radiographic examinations under the supervision of clinical staff. All clinical placements are organised and scheduled by School staff.

Third Year

Imaging Technology II **(RDGY 3001)**

Lectures and practical classes during semesters I and II

Duplication and subtraction. Photofluorography. Monitor photography. Special Imaging techniques. Quality Assurance.

Mechanisms of Disease **(PATH 3002)**

Lectures during semester I

Introduction. Molecular pathology. The immune system. Genetics. Environmental and nutritional pathology.

Diagnostic Imaging I **(RDGY 3002)**

Lectures and practical classes during semesters I and II

Radiography

Hepato-biliary-pancreatic systems. Arthrography. Lymphatic system. Mammography. Cardio-vascular system. Paediatric radiography. Interventional techniques or alternate ERASMUS topic.

Ultrasound

Physics and principles. Scanning protocols. Clinical applications.

Radionuclide Imaging

Physics and principles. Scanning protocols. Clinical applications, Radiopharmacy.

Digital Imaging I **(RDGY 3008)**

Lectures and practical classes in semester I

Terminology, computer fundamentals, hardware and software, operating systems, Quantitisation, sampling, analogue to digital conversion, image quality, image acquisition, digitisers, video capture, direct and computed radiography, fluoroscopic systems, transmission, archival, image display.

Equipment II **(RDGY 3004)**

Lectures and practicals in semester I and II

Adaptations of equipment design. Equipment for mobile radiography, tomography, skull and dental radiography, mammography. Fluoroscopic equipment. Accident and Emergency equipment. Angiographic equipment. Care and maintenance. Design specifications. Quality assurance.

Epidemiology, Statistics and Research Methods **(PHME 3002)**
Lectures in semester I
Natural history of diseases and prevention. Concepts and models. Descriptive and analytical epidemiology. Epidemiology of major chronic diseases.

Types and areas of research. Research design. Methodology. Statistics. Population. Presentation of research.

Management and Health Service Structure **(RDGY 3005)**
Concepts of management with particular reference to the needs of health care professionals in a changing health care environment.

Clinical Skills III **(RDGY 3006)**
Students will attend a range of hospital departments, undertaking most radiographic examinations under the supervision of clinical staff. Students will undertake limited clinical placements at the weekend and in the evenings. Some students may be allowed to attend a European Imaging department. All clinical placements are organised and scheduled by School staff.

Fourth Year

Diagnostic Imaging II **(RDGY 4005)**
Lectures and practical classes during semesters I and II.
Radiography
Accident and Emergency techniques. Skeletal survey and bone densitometry. Central nervous system. Radiography of the elderly. Gynaecological and obstetric examinations. Mobile and operating theatre radiography.

Computed Tomography
Physics and principles. Scanning protocols. Clinical applications.

Magnetic Resonance Imaging
Physics and principles. Scanning protocols. Clinical applications.

Digital Imaging II **(RDGY 4004)**
Image processing, compression, analysis and synthesis. Local and wide area networks. Topology. Industry standards. Quality Assurance.

Legal Medicine **(FMED 4001)**
Medical law and the radiographer. Tort. Medical negligence. Consent. Registration and professional organisations. Ethical issues. Contracts. Acts of the Oireachtas.

Systematic Pathology **(PATH 4005)**

Lectures and tutorials during semester II.

Pathology relevant to diagnostic imaging in each of the following: blood; cardiovascular system including congenital heart defects; respiratory system including mediastinum and pleura; musculo-skeletal system; gastrointestinal tract; hepato-biliary pancreatic systems; genito-urinary systems; reproductive systems and female breast; central nervous system; endocrine disorders; other miscellaneous pathology.

Dissertation **(RDGY 4101)**

Students are required to undertake an individual project which is related to Diagnostic Imaging under the supervision of a member of staff. Three copies of the project must be submitted at a specified time before the fourth year examinations. Candidates may be required to take an oral examination in the subject matter of the project.

Clinical Skills IV **(RDGY 4002)**

Students will attend a range of hospital departments, undertaking most radiographic examinations under the supervision of clinical staff. Students will undertake limited clinical placements at the weekend and in the evenings. All clinical placements are organised and scheduled by School staff.

Postgraduate Courses

Higher Diploma in Diagnostic Imaging/MSc (Mode II)

There is a Higher Diploma/MSc in Diagnostic Imaging in each of the following specialities:

- Computed Tomography;
- Magnetic Resonance Imaging;
- Mammography/Breast Imaging;
- Radionuclide Imaging;
- Ultrasound.

Each of these is a linked course encompassing a Higher Diploma in Diagnostic Imaging as year one of a taught Master's programme. The structure is modular, and may be followed on a full or part time basis, to the end point of choice, i.e.: Higher Diploma in Diagnostic Imaging or MSc.

Higher Diploma students complete a combination of clinical and academic modules over the first calendar year (full time), or two years (part time), and are examined in Practice, Technology and Clinical Skills. Candidates wishing to progress to MSc submit a research proposal, after completion of the examinations of the taught modules. On acceptance of the research proposal, students commence research for the thesis under an appointed supervisor. Concurrently, students attend a course in Research Methodology and Statistics, which is assessed by written examination.

Some courses are open to health care professionals other than radiographers, provided the admission requirements are fulfilled.

All courses operate subject to demand.

Admission Requirements
Places are limited and entry is competitive. Applicants should hold an honours degree in Radiography, or other qualification deemed equivalent, plus appropriate clinical experience in Diagnostic Imaging. Candidates without such qualification may be admitted to the courses, provided they have relevant clinical experience. Applicants may be required to undertake an assessment procedure before entry.

Candidates will not normally be accepted with less than one year of general post-qualification experience. All applicants must present a written commitment from a clinical department confirming availability of at least the minimum amount of clinical experience.

Application
Application forms are available from the School of Diagnostic Imaging, St. Anthony's, Herbert Avenue, Dublin 4 (telephone: 01 209 4288). Application forms are distributed to Clinical Imaging departments nation-wide during recruitment to the programmes

Aims of the Higher Diplomas
To provide programmes of postgraduate education which will equip candidates with the conceptual knowledge and necessary skills to:

1. Competently perform examinations in the chosen field to an expert level.
2. Develop greater professional autonomy and the ability to adapt to the needs of a changing health care sector.
3. Develop an analytical approach relevant to the professional practice of Diagnostic Imaging and associated disciplines.

Course Structure
The attendance for 160 contact lecture hours in the School of Diagnostic Imaging is spread in blocks over the calendar year, to facilitate the nation-wide student cohort. Lectures are grouped in these blocks according to subject, to facilitate part time and/or "modular" students. Approximately one third of the lectures are common across Higher Diplomas in all specialist areas, and address subjects of relevance to experienced radiographers. All subjects are assessed by continuous assessment and end of course written examinations, which are scheduled twice yearly.

The student must spend substantial time in the specialist field to achieve the required experience. This clinical experience will usually take place in the student's own hospital, and also sometimes in specialist centres. Clinical instruction will be given by course lecturers and specific trained staff within the clinical departments. Students will be required to compile a record of clinical practice, with case studies and examination records. Objective clinical assessment will be undertaken on an ongoing basis. The record of clinical practice will be marked throughout the year, with final submission in September. An oral examination may be required.

Successful students will be conferred with the Higher Diploma, or may choose to continue to MSc.

Examinations
Higher Diploma examinations covering Professional Practice and Departmental Operation (2 hours), Practice (2 hours) and Technology (2 hours), take place in. The final submission of the Record of Clinical Practice is also in May.

A proportion of all marks are accrued from in-course clinical assessment. Candidates may be required to undertake an oral examination.

The examination as a whole must be passed by the fourth examination sitting for which the candidate is eligible.

Progression to Degree of Master of Science (Mode II)
At any time up to May following entry to the Higher Diploma programme, students may request registration for a second year as an MSc candidate. Acceptance depends on successful completion of the subjects of the Higher Diploma, and submission of a suitable research proposal in the specialist field. Credit towards the MSc then accrues from the examined subjects of the first year.

Mode II MSc students attend a course in Research Methodology and Statistics in the first and second semesters of the second year, which is assessed by written examination. The concurrent research may be conducted on a full or part time basis under an appointed supervisor, with the thesis usually being submitted in April for full time candidates.

The Degree of MSc (Diagnostic Imaging subject) is then awarded on the basis of all examination results and the thesis. An oral examination may take place in the subject matter of the thesis, at the discretion of the examiners.

Higher Diploma in Diagnostic Imaging (Computed Tomography)

Course Content
The Higher Diploma programme comprises four sections: A, B, C and D.

Section A: Professional Practice and Departmental Operation (RDGY P015)
Each candidate follows a semi-optional combination of subjects in section A, to a maximum of sixty contact hours. Guidance is given on the most appropriate combination of topics from the following:

Obligatory Subjects:

1. Departmental Issues: Patient considerations. Infection control. Medico-legal responsibilities in professional development.

2. Current Imaging: Communication between digital systems: essential factors, compatibility and incompatibility. DICOM III. Transmission methods: Ethernet, fibre optics, Network topologies. Data transmission rates. Impact of signal to noise ratios. Picture Archiving and Communications. Telemedicine. Send and receive stations: Correlation of modalities: clinically useful mergers. Clinical impact of image transmission. Cost effectiveness and impact on patient management.

Two Subjects from the following:

3. Counselling: Counselling theories. Listening and reflecting. Bereavement and loss. Care of the councillor. Includes group work.

4. Equipment Management: Report Analysis. Specifications. Facility Design. Commissioning and operation.

5. Health Screening: WHO principles. Preventative medicine. The screening approach. Requirements of a screening test. Screening methods. Screening population. Cost – benefit analyses. Management of positive screening. Ethical issues.

6. Psychology: Current issues in sick patient psychology. Group dynamics. Stress management.

7. Quality in Healthcare: Quality management, service industry, models of healthcare quality. Quality in healthcare: management, professional and patient perspectives. Accreditation: theory and practice. Risk management. Trends in quality management.

8. Quality in Imaging: Theoretical concepts of quality: multiprofessional team, multiprofessional audit. Management of change. Accreditation. Medical/clinical: Audit, analysis and feedback.

Section B: Practice of Computed Tomography (RDGY P004)
Operating principles. Scanning techniques. Clinical applications, to include consideration of examination techniques on both a systemic and regional basis, to include 3D and image analysis.

Radiation Protection and Dosimetry: Predicted and recorded bioeffects. Dose audit. Dose minimisation techniques.

Section C: Technology of Computed Tomography (RDGY P001)
X-ray generation. Tubes, detectors, collimators. Hardware and software. Data acquisition, processing and presentation.

Radiation Protection and Dosimetry: Predicted and recorded bioeffects. Dose audit. Dose minimisation techniques.

Section D: Clinical Component (RDGY P008)
Candidates will spend approximately 1000 hours in Computed Tomography departments during the course. This is nearly a full time commitment, during which candidates will be required to undertake an extensive range of examinations. Clinical practice will be supervised by course lecturers in liaison with departmental staff.

Candidates will complete a written log of clinical practice, including detailed case studies and audit of their own practice. Candidates will also undergo ongoing assessment of clinical skills, with marks accruing to the final mark for the record of clinical practice.

Higher Diploma in Diagnostic Imaging (Magnetic Resonance Imaging)

Course Content
The first year programme comprises four sections: A, B, C and D.

Section A: Professional Practice and Departmental Operation (RDGY P015)
Each candidate follows a semi-optional combination of subjects in section A, to a maximum of sixty contact hours. Guidance is given on the most appropriate combination of topics from the following:

Obligatory Subjects:

1. Departmental Issues:	Patient considerations. Infection control. Medico-legal responsibilities in professional development.
2. Current Imaging:	Communication between digital systems: essential factors, compatibility and incompatibility. DICOM III. Transmission methods: Ethernet, fibre optics, Network topologies. Data transmission rates. Impact of signal to noise ratios. Picture Archiving and Communications. Telemedicine. Send and receive stations: Correlation of modalities: clinically useful mergers. Clinical impact of image transmission. Cost effectiveness and impact on patient management.

Two Subjects from the following:

3. Counselling:	Counselling theories. Listening and reflecting. Bereavement and loss. Care of the councillor. Includes group work.
4. Equipment Management:	Report Analysis. Specifications. Facility Design. Commissioning and operation.
5. Health Screening:	WHO principles. Preventative medicine. The screening approach. Requirements of a screening test. Screening methods. Screening population. Cost – benefit analyses. Management of positive screening. Ethical issues.
6. Psychology:	Current issues in sick patient psychology. Group dynamics. Stress management.

7. Quality in Healthcare: Quality management, service industry, models of healthcare quality. Quality in healthcare: management, professional and patient perspectives. Accreditation: theory and practice. Risk management. Trends in quality management.

8. Quality in Imaging: Theoretical concepts of quality: multiprofessional team, multiprofessional audit. Management of change. Accreditation. Medical/clinical: Audit, analysis and feedback.

Section B: Practice of Magnetic Resonance Imaging (RDGY P016)
Operating principles, scanning techniques. Consideration of examination techniques on both a systemic and regional basis. 3D techniques and image analysis.

Section C: Technology of Magnetic Resonance Imaging (RDGY P017)
Magnets and magnetism, signal generation, gradients, pulse sequences, image formation, sequence parameters, flow phenomena, safety. Bioeffects, artefacts, quality assurance.

Section D: Clinical Component (RDGY P008)
Candidates will spend approximately 1000 hours in Magnetic Resonance departments during the course. This is nearly a full time commitment, during which candidates will be required to undertake an extensive range of examinations. Clinical practice will be supervised by course lecturers in liaison with departmental staff, and candidates may be required to attend Magnetic Resonance where clinical teaching has been arranged.

Candidates will complete a written log of clinical practice, including detailed case studies, and audit of their own practice. Candidates will also undergo ongoing assessment of clinical skills, with marks accruing to the final mark for the record of clinical practice.

Diploma/Higher Diploma in Diagnostic Imaging (Mammography)

Additional Course Description
The structure is modular, and may be followed on a full or part time basis, to the end point of choice, i.e.: Diploma in Mammography, Higher Diploma in Diagnostic Imaging (Mammography), MSc (Breast Imaging). When followed on a full time basis, the minimum time of completion for each section of the programme will be: Diploma in Mammography – 6 months; Higher Diploma in Diagnostic Imaging (Mammography) – 12 months; MSc (Breast Imaging) – 24 months.

Additional Entry Requirements
A specified caseload is a pre-requisite of all clinical experience contributing to the Mammography/Breast Imaging programme(s).

Course Structure

Section A: Professional Practice and Departmental Operation

Higher Diploma *(RDGY P015);*

Diploma *(RDGY P020).*

Each candidate follows a semi-optional combination of subjects in section A, to a maximum of sixty contact hours for Higher Diploma candidates. Guidance is given on the most appropriate combination of topics from the following:

Obligatory Subjects:

1. Departmental Issues: Patient considerations. Infection control. Medico-legal responsibilities in professional development.

2. Current Imaging: Communication between digital systems: essential factors, compatibility and incompatibility. DICOM III. Transmission methods: Ethernet, fibre optics, Network topologies. Data transmission rates. Impact of signal to noise ratios. Picture Archiving and Communications. Telemedicine. Send and receive stations: Correlation of modalities: clinically useful mergers. Clinical impact of image transmission. Cost effectiveness and impact on patient management.

Two Subjects from the following:

3. Counselling:	Counselling theories. Listening and reflecting. Bereavement and loss. Care of the councillor. Includes group work.
4. Equipment Management:	Report Analysis. Specifications. Facility Design. Commissioning and operation.
5. Health Screening:	WHO principles. Preventative medicine. The screening approach. Requirements of a screening test. Screening methods. Screening population. Cost – benefit analyses. Management of positive screening. Ethical issues.
6. Psychology:	Current issues in sick patient psychology. Group dynamics. Stress management.
7. Quality in Healthcare:	Quality management, service industry, models of healthcare quality. Quality in healthcare: management, professional and patient perspectives. Accreditation: theory and practice. Risk management. Trends in quality management.
8. Quality in Imaging:	Theoretical concepts of quality: multiprofessional team, multiprofessional audit. Management of change. Accreditation. Medical/clinical: Audit, analysis and feedback. Quality in healthcare: management, professional and patient perspectives. Impact of audit.

Section B: Practice of Mammography

Diploma subjects	*(RDGY P021)*
	Breast anatomy, physiology and development. Breast pathology. Operating principles. Breast examinations: clinical examination; mammography; biopsy; stereotaxis. Normal and abnormal radiographic appearances.
Higher Diploma:	*(RDGY P018)*
all above plus:	Disease process and disease management. Screening referral. The asymptomatic patient. Alternate modalities: ultrasound; magnetic resonance; scintimammography; sentinel node imaging. Functional imaging.

Normal and abnormal radiographic appearances. Image appraisal and evaluation. Audit of practice.

Section C: Technology of Mammography

Diploma subjects *(RDGY P022)*

Mammography units: generator; tube; filtration; console; image recording systems, conventional and digital. Compression. Exposure factors. Dosimetry and safety. Legislation.

Processing: dedicated and shared units.

Routine quality assurance.

Higher Diploma *(RDGY P019)*

all above plus:

Mammography units: comparative evaluation of units available. Advanced consideration of filtration and target material. Examination optimisation: exposure and dose, variables with digital units.

Advanced quality assurance.

Section D: Clinical Component

Higher Diploma *(RDGY P008)*

Diploma *(RDGY P023)*

Candidates will have a considerable, nearly full time, clinical commitment to breast examinations during the course. Clinical practice will be supervised by course lecturers in liaison with departmental staff.

Both Diploma and Higher Diploma candidates will complete a written log of clinical practice including detailed case studies and audit of their own practice. Candidates will also undergo ongoing assessment of clinical skills with marks accruing to the final mark for the record of clinical practice.

Higher Diploma in Diagnostic Imaging (Radionuclide Imaging)

Course Content
The Higher Diploma programme comprises four sections: A, B, C and D.

Section A: Professional Practice and Departmental Operation (RDGY P015)
Each candidate follows a semi-optional combination of subjects, to a maximum of sixty contact hours. Guidance is given on the most appropriate combination of topics from the following:

Obligatory Subjects:

1. Departmental Issues:	Patient considerations. Infection control. Medico-legal responsibilities in professional development.
2. Current Imaging:	Communication between digital systems: essential factors, compatibility and incompatibility. DICOM III. Transmission methods: Ethernet, fibre optics, Network topologies. Data transmission rates. Impact of signal to noise ratios. Picture Archiving and Communications. Telemedicine. Send and receive stations: Correlation of modalities: clinically useful mergers. Clinical impact of image transmission. Cost effectiveness and impact on patient management.

Two Subjects from the following:

3. Counselling:	Counselling theories. Listening and reflecting. Bereavement and loss. Care of the councillor. Includes group work.
4. Equipment Management:	Report Analysis. Specifications. Facility Design. Commissioning and operation.
5. Health Screening:	WHO principles. Preventative medicine. The screening approach. Requirements of a screening test. Screening methods. Screening population. Cost – benefit analyses. Management of positive screening. Ethical issues.
6. Psychology:	Current issues in sick patient psychology. Group dynamics. Stress management.

7. Quality in Healthcare: Quality management, service industry, models of healthcare quality. Quality in healthcare: management, professional and patient perspectives. Accreditation: theory and practice. Risk management. Trends in quality management.

8. Quality in Imaging: Theoretical concepts of quality: multiprofessional team, multiprofessional audit. Management of change. Accreditation. Medical/clinical: Audit, analysis and feedback.

   Quality in healthcare: management, professional and patient perspectives. Impact of audit.

Section B: Practice of Radionuclide Imaging (RDGY P006)

Operating principles. Scanning techniques. Clinical applications to include consideration of examination techniques on both a systemic and regional basis, encompassing principles and applications image analysis.

Radiopharmacy design and operation. Radiopharmaceuticals.

Radiation Protection and Dosimetry: General dosimetry and dose measurement. Dose calculations. Legislation: general and specific. Hazard control.

Section C: Technology of Radionuclide Imaging (RDGY P003)

Radiation detection. Computers and electronics. Gamma camera. Calibrators, monitors, counters and dosimeters. Quality assurance. SPECT and PET.

Radiopharmacy. Radionuclides. Cyclotron. Isotope generator.

Section D: Clinical Component (RDGY P008)

Candidates will spend approximately 1000 hours in Radionuclide Imaging departments during the course. This is nearly a full time commitment, during which candidates will be required to undertake an extensive range of examinations. Clinical practice will be supervised by course lecturers, in liaison with departmental staff.

Candidates will complete a written log of clinical practice, including detailed case studies and audit of their own practice. Candidates will also undergo ongoing assessment of clinical skills, with marks accruing to the final mark for the record of clinical practice.

Higher Diploma in Diagnostic Imaging (Ultrasound)

Additional Course Information
Candidates who have completed the Higher Diploma in Diagnostic Imaging or other qualification deemed equivalent, may apply to study individual practice, in which case a Certificate will be awarded.

Course Content
The Higher Diploma programme comprises four sections: A, B, C and D.

Section A: Professional Practice and Departmental Operation (RDGY P015)
Each candidate follows a semi-optional combination of subjects, to a maximum of sixty contact hours. Guidance is given on the most appropriate combination of topics from the following:

Obligatory Subjects:

1. Departmental Issues:	Patient considerations. Infection control. Medico-legal responsibilities in professional development.
2. Current Imaging:	Communication between digital systems: essential factors, compatibility and incompatibility. DICOM III. Transmission methods: Ethernet, fibre optics, Network topologies. Data transmission rates. Impact of signal to noise ratios. Picture Archiving and Communications. Telemedicine. Send and receive stations: Correlation of modalities: clinically useful mergers. Clinical impact of image transmission. Cost effectiveness and impact on patient management.

Two Subjects from the following:

3. Counselling:	Counselling theories. Listening and reflecting. Bereavement and loss. Care of the councillor. Includes group work.
4. Equipment Management:	Report Analysis. Specifications. Facility Design. Commissioning and operation.
5. Health Screening:	WHO principles. Preventative medicine. The screening approach. Requirements of a screening test. Screening methods. Screening population. Cost – benefit analyses. Management of positive screening. Ethical issues.

6. Psychology: Current issues in sick patient psychology. Group dynamics. Stress management.

7. Quality in Healthcare: Quality management, service industry, models of healthcare quality. Quality in healthcare: management, professional and patient perspectives. Accreditation: theory and practice. Risk management. Trends in quality management.

8. Quality in Imaging: Theoretical concepts of quality: multiprofessional team, multiprofessional audit. Management of change. Accreditation. Medical/clinical: Audit, analysis and feedback.

   Quality in healthcare: management, professional and patient perspectives. Impact of audit.

Section B: Practice of Ultrasound **(RDGY P005)**

Principles of Ultrasound Practice. Transducer selection. Scanning techniques. Plus, up to two full units from:

Abdominal scanning (RDGY P701)	(1 module)
Obstetric scanning (RDGY P702)	(1 module)
Vascular ultrasound (RDGY P703)	(1 module)
Gynaecological scanning (RDGY P704)	(0.5 module)
Small parts scanning (RDGY P705)	(0.5 module)
Obs/gynae project	(0.5 module)

Section C: Technology of Ultrasound **(RDGY P002)**

Ultrasound physics: continuous waves, pulsed waves, propagation in tissues, bioeffects. Ultrasound production: beam shapes and transducers. A, M, B and Doppler mode scanners, combination scanners. Mensuration. Quality assurance. Dosimetry and safety.

Section D: Clinical Component **(RDGY P008)**

Candidates will spend approximately 1000 hours in Ultrasound during the course. This is nearly a full time commitment, during which candidates will be required to undertake an extensive range of examinations relevant to the chosen practice options. Clinical practice will be supervised by course lecturers in liaison with departmental staff.

Candidates will complete a written log of clinical practice, including detailed case studies and audit of their own practice. Candidates will also undergo ongoing assessment of clinical skills, with marks accruing to the final mark for the record of clinical practice.

Degree of Master of Science (Diagnostic Imaging Subject), MSc

A candidate who has obtained the Degree of Bachelor of Science (Radiography) from the National University of Ireland, or other primary degree, or other qualification deemed equivalent by the Faculty of Medicine, and who wishes to obtain further postgraduate training, with particular reference to academic and research aspects, shall be eligible to enter for the Degree of Master of Science in Radiography. The degree may be obtained by thesis (Mode I), or by a combination of examination and thesis (Mode II).

Mode I
Candidates must carry out research under the direction of the professor or university lecturer in the subject concerned. The thesis presented by the candidate is to embody the results of this research. The Faculty may approve of the work being carried out elsewhere under the direction of the professor or university lecturer in the subject concerned. Candidates attend a course in Research Methodology and Statistics.

Candidates may be required to pass an oral examination in the subject matter of the thesis, if the examiners so decide. Three copies of the thesis must be lodged with the Supervisor of Examinations, University College Dublin, on or before the date fixed by the University.

Mode II
This route encompasses one from the Higher Diplomas in Diagnostic Imaging as the first year of a taught Master's programme. Students complete a combination of clinical and academic modules over a calendar year, and are examined in Technology, Practice and Clinical Skills. Assessment includes a combination of coursework and written examination. Clinical competence in the specialised field is achieved at the end of year one.

Students wishing to progress to MSc may undertake a second year of research in the particular field and be awarded the Degree of MSc, with credit accruing from the examined subjects of the first year. A research proposal is submitted to the Medical Faculty: on approval, students commence research for their thesis under an appointed supervisor. Concurrently, students attend a course in Research Methodology and Statistics, which is assessed by written examination. An oral examination may also take place in the subject matter of the thesis, at the discretion of the examiners.

Radiographers who have obtained the College of Radiographers Diploma in Medical Ultrasound, or Diploma in Radionuclide Imaging, or other comparable postgraduate diploma, may, at the discretion of the course team, complete one or more specified module(s) from year one. Satisfactory completion will result in the award of a certificate, or credit and entry to year two of the Master of Science, Mode II.

Further information may be obtained from the School of Diagnostic Imaging, St. Anthony's, Herbert Avenue, Dublin 4 (telephone: 01 209 4288).

Doctor of Philosophy (PhD)

Candidates for this degree are required to be admitted by the Faculty on the recommendation of the head of department; admission must then be confirmed by the academic council and the Senate of the University. Candidates who have not graduated in this college may be admitted if suitably qualified. No candidate can be allowed to enter on a course of study and research for a PhD unless he/she has reached a high honours standard at the examination for the primary degree, or has presented such other evidence as will satisfy the Faculty of his/her fitness.

Requirements
The candidate shall pursue research for a period of nine terms but the Senate may accept a period of six terms on the recommendation of the General Board of Studies in the case of a graduate whose attainments justify such shorter course.

The thesis must normally be prepared under the supervision of the Professor, but the Faculty may, on the recommendation of the Professor, assign another member of staff to supervise the candidates research, under the professors' direction.

Examinations
Candidates must carry out research under the direction of the professor or other supervisor in the subject concerned. The thesis presented by the candidate is to embody the results of this research. Three copies of the thesis must be lodged with the Supervisor of Examinations, University College Dublin, on or before the date fixed by the University. Candidates will be required to take an oral examination on the subject matter of their thesis

The Degree will not be awarded unless the examiners report the work is worthy of publication as a whole or in part.

Candidates for the PhD Degree will be allowed six years from the date of registration in which complete their Degree. If they have not done so within this time period, they must re-apply for registration.

Application Procedure
Particulars and application forms may be obtained from the School of Diagnostic Imaging, St. Anthony's, Herbert Avenue, Dublin 4, Ireland. (Telephone: 01 209 4288).