ERIE • CORRY • MEADVILLE • TITUSVILLE • NORTHEAST OHIO

The Regional Cancer Center

*Comprehensive Care for Cancer and Blood Disorders*

2500 West Twelfth Street
Erie, Pennsylvania 16505
(814) 838-9000
(800) 477-6647
www.trcc.org



RE: Change of Personnel
License Number 37-30885-01
Docket 03036511
Mail control 136864

May 23, 2005

K-8
MS-16

Sandra Gabriel
U. S. Nuclear Regulatory Commission
Region I, 475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

Dear Ms. Gabriel,

I am writing to attest to the training and full time employment of Mr. Jeremy D. Donaghue, MS at The Regional Cancer Center of Erie, Pennsylvania.

Mr. Donaghue became an employee of The Regional Cancer Center in September 2003 and has worked as a full time medical physicist to date.

During his employment with The Regional Cancer Center he preformed the following tasks as related to High Dose Rate Brachy-therapy:

a. Decay of Iridium 192
b. Hand Calculation checks of PLATO treatment planning software plans. (2nd independent checks)
c. Check of source activity, based on decay, listed in PLATO treatment planning software and the Treatment Console software.
d. Proper use of the HDR Remote Afterloader and software including emergency procedures.
e. Area radiation surveys include shielding evaluation of the unit and treatment room and patients after treatment.
f. Calibration of the Iridium 192 source and periodic spot checks of the unit.
g. Required Quality Assurances test.

I served as his preceptor for this time.

Regards,

David J. Hinckley, MS (DABR)
Radiation Safety Officer

sjpc

136864
NMSS/RGN1 MATERIALS-002

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The Regional Cancer Center

Comprehensive Care for Cancer and Blood Disorders

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RE: Change of Personnel
License Number 37-30885-01
Docket 03036511
Mail control 136864

May 23, 2005

Sandra Gabriel
U. S. Nuclear Regulatory Commission
Region I, 475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

Dear Ms. Gabriel,

Enclosed please find additional documentation to add Mr. Jeremy D. Donaghue to NRC license number 37-30885-01.

Included in this letter are the following:

a. Photocopy of Diploma
b. Copy of transcripts
c. Copy of Cleveland State University Practicum Course at Cleveland Clinic Foundation.
d. Letter of continuing training and full time employment at The Regional Cancer Center from David J. Hinckley, MS. DABR, RSO

Please contact David Hinckley, (814-838-0450) if you require any further information concerning this request.

Thank you,

Roy Smith, MD
CEO / Medical Director

sjpc
Enclosures

# Cleveland State University

## COLLEGE OF GRADUATE STUDIES

THE PRESIDENT AND TRUSTEES OF CLEVELAND STATE UNIVERSITY
UPON RECOMMENDATION OF THE FACULTY HAVE CONFERRED UPON

**Jeremy David Donaghue**

THE DEGREE OF

**Master of Science in Physics**

IN RECOGNITION OF THE SATISFACTORY FULFILLMENT
OF THE REQUIREMENTS PERTAINING TO THIS DEGREE.
CONFERRED AT CLEVELAND, OHIO,
THIS THIRTEENTH DAY OF DECEMBER, 2003.

CHAIRMAN OF THE BOARD OF TRUSTEES

PRESIDENT OF THE UNIVERSITY

DEAN

# CLEVELAND STATE UNIVERSITY

## MS IN PHYSICS WITH EMPHASIS ON MEDICAL PHYSICS

In a new partnership aimed at training the next generation of medical physicists across Northeast Ohio, The Cleveland Clinic Health System and Cleveland State University have developed an education program in a health-related field – the Medical Physics Emphasis within the MS in Physics Program. It is the only program of its kind in northeast Ohio.

Medical physicists are highly skilled specialists who apply the concepts and methods of physics to the diagnosis and treatment of human disease. Among other duties, they optimize mamographic systems and help deliver radiation therapy to cancer patients. The new program is aimed at attracting physicists, chemists and engineers and getting them into the medical physics workforce, which is experiencing a shortage nationwide.

Several Cleveland Clinic physicists were conferred the adjunct faculty status in our department: Department of Radiation Oncology: Dr. Qin-sheng Chen, Dr. Christopher Deibel, Lead Physicist for Quality Assurance, Dr. Gennady Neyman, Lead Physicist for Gamma Knife Radiosurgery, Dr. Martin Weinhous, Chief of Medical Physics, Dr. Douglas Wilkinson, Vice-Chief of Medical Physics; Division of Diagnostic Radiology: Dr. William Davros, Head, Section of Medical Physics.

To be considered for admission to the MS in Physics students must meet Graduate College requirements, available on the web: http://www.csuohio.edu/gradcollege/admit/, and have an undergraduate degree in physics, chemistry, chemical engineering, electrical engineering, mechanical engineering or nuclear engineering.

The medical physics emphasis curriculum consists of:

- two lecture courses PHY530 Introduction to Medical Physics, PHY535 Medical Therapy Physics that are delivered by the Cleveland Clinic adjuncts; two semesters of project (practicum) at Cleveland Clinic;
- four courses taught by the CSU faculty: PHY515 Introduction to Biological Physics, PHY520 Computational Physics, PHY565 Image Processing, and PHY570 Environmental Physics.

For students applying to the Medical Physics program, the following courses must be taken if there are deficiencies in the applicant's undergraduate preparation: PHY330 Introduction to Modern Physics, PHY350 Electricity and Magnetism, PHY360 Electronics Laboratory, PHY474 Thermal Physics, BIO266 Human Anatomy and Physiology, BIO267 Human Anatomy and Physiology Laboratory.

Student support is available through the Medical Physics Fellowship program, tuition grants and other employment opportunities at the Cleveland Clinic Foundation. The Medical Physics Fellow will work during the first year of the program in the Physics Department at Cleveland State University and during the second year of the program in the Radiation Oncology Department at the Cleveland Clinic Foundation.

If you are interested in the MS in Physics with emphasis on Medical Physics program please contact Dr. Miron Kaufman, 216-6872436, m.kaufman@csuohio.edu

# Cleveland State University

**OFFICIAL ACADEMIC TRANSCRIPT FOR**

ISSUED TO STUDENT

This is a RED stamp



Name : Donachue Jeremy David
Student ID: [redacted]
SSN

Print Date 2005-05-16

## Degrees Awarded

| | |
|---|---|
| Degree | Bachelor of Science |
| Confer Date | 2001-05-12 |
| Plan | Mathematics |
| Plan | Physics |
| Degree | Bachelor of Arts |
| Confer Date | 2003-05-09 |
| Plan | Physics |
| Degree | Master of Science in Physics |
| Confer Date | 2003-12-13 |
| Plan | Physics |

## Transfer Credits

* CUMULATIVE QUARTER CREDIT HOURS CONVERTED TO *
* SEMESTER CREDIT HOURS EFFECTIVE FALL TERM, 1998 *
* ONE QTR HOUR CONVERTS TO .6666667 SEMESTER HRS. *

Summer Semester 2003

Transfer Credit from Cleveland State Univ - Spr 2001 to Spr 2002

| | | | | |
|---|---|---|---|---|
| PHY | 493 | Intro to Medical Physics | 4.00 | 4.00 |
| PHY | 49[illegible] | Intro to Biophysics | 4.00 | 4.00 |
| PHY | 565 | Image Processing | 4.00 | 4.00 |
| Course Trans GPA | 0.000 Transfer Totals : | | 0.00 | 12.00 |

0.000

Beginning of Graduate Record

Spring Semester 2003

Program : Graduate Arts & Sciences

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| [illegible] | [illegible] | Topics/Math Travelers | 4.00 | 4.00 | A | 16.000 |
| PHY | 520 | Computation Phy | 4.00 | 4.00 | A- | 14.860 |
| PHY | 598 | Project | 4.00 | 4.00 | B | 12.000 |
| TERM GPA : | 3.567 | TERM TOTALS : | 12.00 | 12.00 | | 42.800 |

Summer Semester 2003

Program : Graduate Arts & Sciences

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| PHY | 598 | Project | 4.00 | 4.00 | B | 12.000 |
| TERM GPA : | 3.000 | TERM TOTALS : | 4.00 | 4.00 | | 12.000 |

Fall Semester 2003

Program : Graduate Arts & Sciences

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| PHY | 598 | Project | 4.00 | 4.00 | B | 12.000 |
| TERM GPA : | 3.000 | TERM TOTALS : | 4.00 | 4.00 | | 12.000 |

Cumulative Totals

| | | | Attempted | Earned | Points |
|---|---|---|---|---|---|
| CUM GPA : | 3.340 | CUM TOTALS | 20.00 | 32.00 | 66.800 |

***** End of Transcript *****

Page 1 of 1

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Ronald L. Bowman, Jr.
University Registrar

# Cleveland State University

**OFFICIAL ACADEMIC TRANSCRIPT FOR**



Name : Donaghue,Jeremy David
Student ID: [redacted]
SSN :

Print Date : 2005-05-18

ISSUED TO STUDENT

This is a RED stamp

- - - - - Degrees Awarded - - - - -

| | |
|---|---|
| Degree | Bachelor of Science |
| Confer Date | 2004-05-12 |
| Plan | Mathematics |
| Plan | Physics |
| Degree | Bachelor of Arts |
| Confer Date | 2003-05-09 |
| Plan | Physics |
| Degree | Master of Science in Physics |
| Confer Date | 2004-12-13 |
| Plan | Physics |

- - - - - Transfer Credits - - - - -

**Summer Semester 2000**

**Transfer Credit from Ohio State University**

| | | | | |
|---|---|---|---|---|
| AH | 100 | Arts & Humanities Requirement | 3.33 | 3.33 |
| EDU PAES | 169.13 | Tae Kwon Do I | 0.67 | 0.67 |
| EDU PAES | 169.15 | T'ai Chi Chuan I | 0.67 | 0.67 |
| PHARMACY | 200 | Mathi-Irratnl Drug | 2.00 | 2.00 |
| PHL | 211 | Morals & Rights | 3.33 | 3.33 |
| PHY | 241 | Univ Physics I | 3.33 | 3.33 |
| PHY | 241 | Univ Physics I | 3.33 | 3.33 |
| PHY | 242 | Univ Physics II | 3.33 | 3.33 |
| WOC | 100 | Western Culture & Civilization | 3.33 | 3.33 |

Course Trans GPA: 0.000 Transfer Totals: 6.00 23.32 0.000

**Summer Semester 2000**

**Transfer Credit from Cuyahoga Community College-Metro**

| | | | | |
|---|---|---|---|---|
| ENG | 101 | English I | 2.00 | 2.00 |
| ENG | 101 | English I | 0.67 | 0.67 |
| MTH | [illegible] | Calculus I | 3.33 | 3.33 |
| MTH | [illegible] | Calculus I | 3.33 | 3.33 |
| MTH | 192 | Calculus II | 3.33 | 3.33 |
| NS | 100 | Natural Science Requirement | 2.67 | 2.67 |
| NS | 100 | Natural Science Requirement | 0.67 | 0.67 |
| NS | 100 | Natural Science Requirement | 1.33 | 1.33 |
| NS | 100 | Natural Science Requirement | 2.67 | 2.67 |
| NS | 100 | Natural Science Requirement | 0.67 | 0.67 |
| PHL | 121 | Intro To Phl | 2.67 | 2.67 |
| PSY | 101 | Intro To Psych | 2.00 | 2.00 |
| SS | 100 | Social Science Requirement | 2.67 | 2.67 |

Course Trans GPA: 0.000 Transfer Totals: 0.00 28.01 0.000

- - - - - Other Credits - - - - -

Other Credits Applied Toward Arts & Sciences Degree Seeking Program

**Spring Semester 2001**

| | | | | |
|---|---|---|---|---|
| ENG | 102 | English II | 3.00 | 3.00 |

Other Trans GPA: 0.000 Transfer Totals: 0.00 3.00 0.000

- - - - - Beginning of Undergraduate Record - - - - -

**Winter Quarter 1997**

**Program : Nondegree**

| Course | | Description | Attempted | Earned Grade | Points |
|---|---|---|---|---|---|
| CHM | 203 | College Chem II | 4.00 (*) | 0.00 NA | |
| CHM | 207 | Coll Chem Lab II | 1.00 | 0.00 F | |
| CIS | 260 | Comp Prog I | 4.00 | 0.00 F | |
| ELE | 313 | Elec Circuits I | 4.00 | 0.00 F | |
| MTH | 172 | Anal Geom & Calc | 4.00 | 0.00 F | |

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(*) Hours Not Counted in GPA



Ronald L. Bowman, Jr.
University Registrar

# Cleveland State University

OFFICIAL ACADEMIC TRANSCRIPT FOR



Name: Donaghue/Jeremy David
Student ID: [redacted]
SSN

ISSUED TO STUDENT

This is a RED stamp

| | | | | | |
|---|---|---|---|---|---|
| TERM GPA : | 0.000 | TERM TOTALS : | 13.00 | 0.00 | 0.000 |

**Fall Semester 1999**

Program : Nondegree

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| ENG | 301 | Adv Exposit Wrtg | 4.00 | 4.00 | A | 16.000 |
| Course Topic(s) | | Newspaper Writing | | | | |
| MTH | 281 | Multivariab Calc | 4.00 | 4.00 | A | 16.000 |
| PES | 169 | Int Tae Kwon Do | 1.00(*) | 1.00 | S | |
| PHL | 131 | Deductv Logic I | 4.00 | 4.00 | A | 16.000 |

| | | | | | |
|---|---|---|---|---|---|
| TERM GPA : | 4.000 | TERM TOTALS : | 13.00 | 13.00 | 48.000 |

**Spring Semester 2000**

Program : Nondegree

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| COM | 101 | Prin Of Com | 4.00 | 4.00 | A | 16.000 |
| MTH | 286 | Intro/Diff Equat | 4.00 | 4.00 | A | 16.000 |
| MTH | 288 | Linear Algebra | 4.00 | 4.00 | B+ | 13.200 |
| PES | 169 | Int Tae Kwon Do | 1.00(*) | 1.00 | S | |
| PHL | 471 | Epistemology | 4.00(*) | 0.00 | X | |

| | | | | | |
|---|---|---|---|---|---|
| TERM GPA : | 3.760 | TERM TOTALS : | 12.00 | 13.00 | 45.200 |

**Summer Semester 2000**

Program : Arts & Sciences Degree Seeking

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| HIS | 315 | Afr-Amer Sc 1877 | 4.00 | 4.00 | A | 16.000 |
| MTH | 493 | Sp Topics/Math | 4.00 | 4.00 | B | 12.000 |
| Course Topic(s) | | History of Calculus | | | | |
| MTH | 497 | Readings In Math | 4.00 | 4.00 | A- | 14.800 |
| Course Topic(s) | | Rdgs Chaos & Fractals | | | | |

| | | | | | |
|---|---|---|---|---|---|
| TERM GPA : | 3.560 | TERM TOTALS : | 12.00 | 12.00 | 42.800 |

**Fall Semester 2000**

Program : Arts & Sciences Degree Seeking

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| MTH | 301 | Intro/Appld Math | 4.00 | 4.00 | B+ | 13.200 |
| [illegible] | [illegible] | [illegible]metry | 4.00 | 4.00 | A | 16.000 |
| MTH | 420 | Combinatorl Math | 4.00 | 4.00 | B | 12.000 |
| MTH | 495 | Senior Seminar | 2.00 | 2.00 | A | 8.000 |
| MUS | 151 | Jazz Survey | 4.00 | 4.00 | B | 12.000 |
| PHY | 330 | Intr Mod Physics | 4.00 | 4.00 | B+ | 13.200 |

| | | | | | |
|---|---|---|---|---|---|
| TERM GPA : | 3.380 | TERM TOTALS : | 22.00 | 22.00 | 74.400 |

**Spring Semester 2001**

Program : Arts & Sciences Degree Seeking

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| COM | 331 | Gender & Com | 4.00 | 4.00 | A- | 14.800 |
| MTH | 358 | Abstract Algebra | 4.00 | 4.00 | A | 16.000 |
| MTH | 487 | Dynamical Systms | 4.00 | 4.00 | A | 16.000 |
| MTH | 493 | Sp Topics/Math | 4.00 | 4.00 | A | 16.000 |
| Course Topic(s) | | Chaos Theory-Bngrg | | | | |
| PHY | 493 | Adv Topics Phy | 4.00 | 4.00 | B | 12.000 |
| Course Topic(s) | | Intro to Medical Physics | | | | |

| | | | | | |
|---|---|---|---|---|---|
| TERM GPA : | 3.740 | TERM TOTALS : | 20.00 | 20.00 | 74.800 |

**Fall Semester 2001**

Program : Arts & Sciences Degree Seeking

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| CIS | 260 | Intro to Prog | 4.00 | 4.00 | A | 16.000 |
| PHY | 201 | Stars & Galaxies | 4.00 | 4.00 | A | 16.000 |
| PHY | 329 | Intro Comp Phy | 4.00 | 0.00 | F | |
| Notes | | Previous Grade ( I) | | | | |
| Notes | | 05/03/02 | | | | |
| PHY | 474 | Thermal Physics | 4.00 | 4.00 | A- | 14.800 |

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* Hours Not Counted In GPA

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Ronald L. Bowman, Jr.
University Registrar

MAY-24-2005 15:38 RCC EXECUTIVE OFFICES 814 838 0464 P.09

# Cleveland State University

**OFFICIAL ACADEMIC TRANSCRIPT FOR**



Name Donagnue,Jeremy David
Student ID. [redacted]
SSN

ISSUED TO STUDENT

This is a RED stamp

TERM GPA : 2.920 TERM TOTALS : 16.00 12.00 36.000

**Spring Semester 2002**

Program : Arts & Sciences Degree Seeking

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| MTH | 434 | Diff Geometry | 4.00 | 4.00 | B+ | 13.200 |
| PHY | 350 | Electy/Magnetism | 4.00 | 4.00 | B- | 10.800 |
| PHY | 493 | Adv Topics Phy | 4.00 | 4.00 | B | 12.000 |
| Course Topic(s) : Intro Biophysics | | | | | | |

TERM GPA : 3.000 TERM TOTALS : 12.00 12.00 36.000

**Fall Semester 2002**

Program : Arts & Sciences Degree Seeking

| Course | | Description | Attempted | Earned | Grade | Points |
|---|---|---|---|---|---|---|
| PHY | 340 | Mechans/Vibrats | 4.00 | 4.00 | B | 12.000 |
| PHY | 360 | Electronics Lab | 4.00 | 4.00 | B- | 10.800 |
| Notes | | : Previous Grade: I | | | | |
| Notes | | : 05/02/03 | | | | |
| PHY | 535 | Radiation Therapy Phy | 4.00 | 4.00 | C+ | 9.200 |
| PHY | 565 | Image Processing | 4.00 | 4.00 | A | 16.000 |

TERM GPA : 3.000 TERM TOTALS : 16.00 16.00 48.000

**Cumulative Totals**

| | | Attempted | Earned | Points |
|---|---|---|---|---|
| CUM GPA : 3.180 | CUM TOTALS : | 131.67 | 174.33 | 416.000 |

***** End of Transcript *****

Page 3 of 3

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Ronald ... Bowman, Jr.
University Registrar

## Cleveland State University Practicum Course at Cleveland Clinic Foundation

The purpose of this practicum course is to complement introductory training in therapeutic radiology with hands-on experience in the clinic. Most parts of this training contain two parts: observation of the procedure by a clinical medical physicist and conduction of similar measurements by the student. For each of these parts, the student will prepare a written report, which will be graded by the medical physicist who did the initial training. It is the responsibility of the student to compete the required course of instruction by finding a physicist who will be doing these tasks, and learning from the physicist as he/she is completing these tasks. Since some tasks are performed once in a year, it is important that the student go about acquiring experience with due haste. The tasks will not be performed by the physicist for teaching, rather to satisfy requirements of the physicist's job.

Ref: AAPM Report No. 79 titled "Academic Program Recommendations for Graduate Degrees in Medical Physics" section 4.4. See reports #79 on www.aapm.org.

Project 1 - Overview of Clinical Radiation Oncology

1. View videotape prepared for patients showing usual path through treatment.
2. Attend at least one Grand Chart Rounds. These occur at 8 am on some Thursday mornings.
3. From the presentations in Grand Chart Rounds, choose one disease site. Work with a physicist or dosimetrist to select a patient with this disease who will be treated using a 3D external beam non/IMRT computer plan. Follow this patient through CT acquisition, simulation, treatment planning and first treatment.
4. Create a flow diagram demonstrating the knowledge of the path of a patient in the treatment process.
5. Discuss your understanding of this process with the physicist. Write a 1 to 2 page report about the process including any observed flaws and or recommendations for improvement, and present the report to the physicist for grading.

Project 2 – Absorbed Dose Determinations

1. Calibrate a linac photon beam using the TG-51 protocol. (You will have observed the physicist doing this during the annual QA) Discuss your calibration with the physicist in charge of the linac, who will grade your effort.
2. Calibrate an electron beam, beginning with energy determination, using the TG-51 protocol. (You will have observed the physicist doing this during the annual Q.A.) Discuss your calibration with the physicist in charge of the linac, who will grade your effort.
3. Work with a physicist doing TLD measurements. Perform two clinical TLD measurements, including requisite calibrations. (The TLD measurements could be for a patient undergoing total body irradiation.) Tender your report to the physicist with whom you observed the clinical TLD measurements, who will grade it.
4. Use film dosimetry to measure electron depth doses and to measure the flatness and symmetry of an electron beam. Tender your report to the physicist with whom you observed the clinical film dosimetry, who will grade it.

Project 3 – Photon Beams: Basic Dose Descriptors

1. Demonstrate understanding of definition and use of GTV, CTV, and PTV. Suggestion: review protocols in which these terms are applied; see www.rtog.org. Review patient treatment plans where these protocols have been applied. Take one case in which these terms were used, and in a short paragraph, discuss how they were used.
2. Measure PDDs and compare the results with data taken during the annual or with data in the databook.
3. Calculate TMRs from measurements made with your assistance during the annual at two depths and three field sizes. Your calculations must be done by hand; using a packaged computer program as a second check is optional. Measure these TMRs with ion chamber. Compare measured data with calculated data and with data in the clinical data book. Present a short report on the materials, methods, and results.
4. Calculate MU for 10 different clinical fields by hand using the clinical data book. Compare with computer plan and "mucalc" program results. At least three of these cases must be irregular field. For the three irregular field cases you select, you must perform by hand a Clarkson-type integration and compare with computer and your hand-calculation approximation. A physicist or dosimetrist must sign off on this result.
5. Calculate a rotational beam plan by hand and by computer.
6. Turn your finished results in for credit.

Project 4 – Photon Beams: Dose Modeling for External Beams and IMRT

1. For an external beam computer planning system, for the photon beam non-IMRT planning module:
    a) Review the algorithm
    b) Describe input data.
    c) Review tests to be performed to determine planning system accuracy.
    d) Perform these tests for a small subset of data for one linac and one energy.
2. For an external beam computer planning system, for the photon beam IMRT planning module:
    a) Review the algorithm
    b) Describe input data
    c) Review tests to be performed to determine planning system accuracy.
    d) Perform these tests for a small subset of data for one linac and one energy.
3. Your report should include:
    a) Discussion of algorithms used by your chosen planning system.
    b) Subset printout of data input to the planning system, taken from the planning system.
    c) Review of tests to be performed.
    d) Results of these tests. This may also include plots of comparison of input and output data for the system.
    e) Suggestion of tests that should be performed whenever the planning system is upgraded.
4. Some useful references include:
    a) J. Van Dyk et al, Commissioning and Quality Assurance of Treatment Planning computers, I. J. Rad. Onc. Biol. Phys. 26(2): 261-273, 1993
    b) AAPM TG53: Quality Assurance for clinical radiotherapy treatment planning. 1999. See report #62 on www.aapm.org.
    c) Swiss Society of Radiobiology and Medical Physics: Quality control of treatment planning systems for teletherapy. www.sgsmp.ch. 1999.

Project 5 – Photon Beams: Patient Application of External Beams, and IMRT

1. Observe the creation of at least one External Beam CT based Plan.
2. Create one X-ray CT based plan that uses custom blocking and wedges.
3. Observe at least 1 IMRT Beam Plan's creation. Options include:
    A. BAT with IMRT for Primus or 2100-2
    B. Peacock planning for 600c
    C. IMRT Planning at CCF satellites as they come on line.
4. Observe the treatment process for the external beam and IMRT plan you observed being created. This shall include simulation, port filming, and first treatment.
5. Write a report detailing this experience. Include the computer plan you made.

Project 6 – Electron Beam Therapy

1. Review algorithm used for Electron Beam treatment planning in an available treatment-planning computer.
2. Create a treatment plan.
3. Hand calculate MU for this plan.
4. Work with a physicist to perform special dosimetry for one electron cutout. Measure the characteristics of an electron cutout, including percent depth dose, isodoses, and output factor. Compare this result with that you obtain from modeling this situation on the treatment-planning computer, and from a hand calculation.
5. Write report detailing experience and commenting on difficulties, uncertainties, and potential errors in these calculations

Project 7 – Brachytherapy

1. Observe one $^{125}I$ implant, including planning.
2. Participate in monthly QA of HDR machine. Review TG-40 e.g. Tables IX-XI, XIII.
3. Observe HDR planning
   A. Film based.
   B. CT based.
4. Create a simple HDR plan (with assistance) from film or CT.
5. Observe IVB either Beta or Gamma.
6. Perform cervix and planar implant calculations by hand and by computer. Compare results and comment on this method of checking the computer treatment plan.
7. Write report detailing the experience and commenting on the pros and cons of different techniques. Comment on possible sources of error in procedures. Comment on difficulties associated with having a Brachytherapy program and possible problems and solutions that could arise.

Project 8 – Radiation Protection

1. Calculate required shielding for one of the linacs installed at CCF or satellite. Assume IMRT will be used on this linac. Shield to exposure levels required by state law.
2. Compare this calculation to actual shielding used. Comment on comparison.
3. Survey this linac with ion chamber survey meter and compare calculations to measurements.
2. Include calculations and rationalization for choices in your report.

Project 9 – Quality Assurance/ Quality Control.

1. Linac Quality Assurance
   A. Attend an *annual* quality assurance survey of a linear accelerator. Assist the physicist by creating the report of this survey, referring to the TG-40 (http://www.aapm.org/pubs/reports/ #46) and Ohio State (www.odh.state.oh.us, reg. 3701:1-66-15) requirements. The completed survey report you write will be the documentation of the annual Q.A. for this linac. You will edit the report until the physicist for whom you are writing it accepts it.
   B. Observe monthly QA on two different brands of linac
   C. Under supervision, repeat portions of monthly QA
      1) Light field / radiation field coincidence
      2) Output
      3) Gantry, collimator, table angle and position checks
      4) Others to be determined.
2. Treatment planning computer Quality Assurance.
   A. Review literature concerning usual Quality Assurance for a treatment planning computer, e.g. TG-40 Table V.
   B. Perform usual quality assurance tests, other than commissioning which is covered above.
3. Simulator Quality Assurance
   A. Review literature concerning usual Quality Assurance for a Simulator and CT-simulator, e.g. TG-40 table III. Compare to present Q.A. program.
   B. Participate in Q. A. of Simulator and CT-simulator.
4. Q. A. of measurement instruments.
   A. Review and suggest a Quality Assurance program for measurement instruments, e.g. TG-40 Table IV.
   B. Participate in an inter-comparison of dosimetry equipment.
5. Write a report (1 to 2 pages) detailing observations and making comments on what was important and what was "additional" testing for the machine.