

## **RADI 6864**

Course Instructor:	Imad Ali, Ph.D., DABR
Course Title:	RADI-6864: Radiological Physics I (Therapy Track)
Credit Hours:	4 credit hours (including lectures and labs)
Frequency and time:	Spring Semester Even Years
Faculty Involved:	Salahuddin Ahmad, Ph.D., DABR, Tania De La Fuente Herman, Ph.D. , DABR, Hosang Jin, Ph.D., DABR, Yong Chen, Ph.D. , DABR, Sabbir Hossain, Ph.D., DABR, Dan Johnson, Ph.D., DABR.
Staff Physicists Involved:	Kerry Hibbitts, M.Sc., DABR, Erich Schnell, M.Sc., DABR.
Text:	<p><b>The Physics of Radiation Therapy</b> Faiz M. Khan et al, <i>4th Edition</i> Lippincott Williams &amp; Wilkins, 2009</p> <p><b>Radiation Oncology Physics</b> Technical Editor: E.P. Podgorsak IAEA Publications, 2005</p> <p><b>Radiation Therapy Physics</b> W.R. Hendee, G.S. Ibbott, E.G. Hendee et al John Wiley &amp; Sons, 2005</p> <p><b>Treatment Planning in Radiation Oncology</b> Faiz M. Khan et al, Lippincott Williams &amp; Wilkins, 2003</p> <p><b>The Modern Technology of Radiation Oncology</b> J. Van Dyk et al, Medical Physics Publishing, 1999</p> <p><b>The Physics of X-rays Linear Accelerators.</b> P. Metcalfe, .T Kron, P. Hoban,</p>
Supplemental readings:	<ul style="list-style-type: none"><li>- AAPM Task Group Reports (T40, TG142, TG21, TG51 TG25, TG45, TG43, TG-104, TG-105, TG106 and other task groups as indicated in the reading and assignments),</li><li>- NCRP Reports 49 and 79, 147, 151 and Journal Articles</li><li>- ICRU 62, 71, 78</li></ul>
Time:	Monday & Wednesday each week 3:00 – 5:00 pm. Laboratory: depends on machine availability (4:00-6:00 pm)
Method of student Evaluation:	Assignments (15%), Quiz (10%), Discussions/Contributions (10%) Labs (15%), Tests (Mid-term 25%, Final 25%),

Class #	Date	Topics	Lecturer	Assignments/Readings
1	1/20/2016	-Introduction for the Course -Dose Distributions and Dosimetric Concepts	IA	-Khan ch.9 -Podgorsak ch.6
2	1/25/2016	Corrections for Body Contours and Tissue Inhomogeneity	IA	-Khan ch.11,12 -Podgorsak ch.6/7/11 -Metcalf Ch. 6.
3	1/27/2016	Dose Calculation Algorithms.	IA	-Khan ch.11/12 -Podgorsak ch.7/11 - Metcalfe Ch. 7. - Paper references.
4	2/1/2016	Treatment Planning and Isodose Distributions, Patient Data	IA	-Khan ch.11/12 -Podgorsak ch.7/11
5	2/3/2016	<b>Laboratory I: Treatment Planning: Patient Data, Corrections, Beam Design, Optimization and Dose Calc.</b>	ES/IA	-Khan ch.12/13 -Podgorsak ch.7/11 - AAPM TG-65: Tissue Inhomogeneity Corrections for Megavoltage Photon Beams - AAPM TG-105: Issues Associated with the Implementation of Monte-Carlo-Based Photon and Electron treatment Planning
6	2/8/2016	Electron Beam Therapy, Dosimetric Parameters and Dose Calculation	DJ	-Khan ch.14 -Podgorsak ch.8 - AAPM TG-25: Clinical electron-beam dosimetry. - AAPM TG-70: Supplement to TG-25 - ICRU 71: Prescribing, Recording, and Reporting Electron Beam Therapy
7	2/10/2016	<b>Laboratory II: Electron MU Calculation and Cutout Output Measurement</b>	DJ	-Khan ch.14 -Podgorsak ch. - Same as above for electrons
8	2/15/2016	Brachytherapy I: Radioactive Decay, Sources, Calibration.	TDLFH	-Khan ch.15 -Podgorsak ch.13
9	2/17/2016	Brachytherapy II: Dose Calculation, Dose Implantation Systems	TDLFH	-Khan ch.15 -Podgorsak ch.13 - AAPM TG-43: Dosimetry of Interstitial Brachytherapy Sources
10	2/22/2016	-High Dose Rate Brachytherapy -Intraoperative Radiotherapy	TDLFH	-Khan ch.22 -Podgorsak ch.15 - AAPM TG-59: High dose rate brachytherapy treatment delivery - AAPM TG-72: Intraoperative radiation therapy using mobile electron linear accelerator.
11	2/24/2016	Commissioning, Calibration and Quality Assurance I	YC	-Khan ch.17 -Podgorsak ch.12 AAPM TG-106: Accelerator beam commissioning equipment procedure. AAPM TG-54: Protocol for

				<ul style="list-style-type: none"> <li>- AAPM Tg-21: A protocol for the determination of the absorbed dose for high-energy photon and electron beams.</li> <li>- AAPM TG-61: AAPM protocol for 40-300 kV x-ray beam dosimetry in radiobiology.</li> </ul>
12	2/29/2016	Commissioning, Calibration and Quality Assurance II	YC	<ul style="list-style-type: none"> <li>-Khan ch.17</li> <li>-Podgorsak ch.9/10/12</li> <li>-AAPM TG-40: Comprehensive QA for Radiation Oncology.</li> <li>- AAPM TG-142: Quality Assurance of medical accelerators.</li> </ul>
13	3/2/2016	Commissioning, Calibration and Quality Assurance III	YC	- same as above
14	3/7/2016	Quality Management: policies, procedures, recording system.	YC	<ul style="list-style-type: none"> <li>- ACR Practice Guideline for Radiation Oncology</li> <li>-IAEA Report "COMPREHENSIVE AUDITS OF RADIOTHERAPY PRACTICES"</li> <li>-ACR Technical Standard for the Performance of Radiation Oncology Physics for External Beam Therapy</li> </ul>
15	3/9/2016	Radiobiological Dose Modeling	SA	<ul style="list-style-type: none"> <li>-Podgorsak ch.14</li> <li>- AAPM TG-1: Quality Assessment and Improvement of Dose Response Models: Some Effects of Study Weaknesses on Study Findings</li> </ul>
16	3/11/2016	<b>Mid Term Exam</b>	<b>IA</b>	
-	3/12/2016	<b>Vacation days 3/12-20/2016</b>	-	<b>Vacation 3/12-20/2016</b>
-	3/20/2016	<b>Vacation days</b>	-	-
17	3/21/2016	-3D Conformal Radiation Therapy - Intensity Modulated Radiation Therapy	HJ	<ul style="list-style-type: none"> <li>-Khan ch.19/20</li> <li>-Podgorsak ch.15</li> <li>-AAPM TG-119: IMRT commissioning; Multiple institution planning and dosimetry and comparison</li> <li>- AAPM TG-120: Dosimetry tools and techniques for IMRT</li> </ul>
18	3/23/2016	<b>Laboratory III: IMRT Quality Assurance</b>	HJ	<ul style="list-style-type: none"> <li>-Khan ch.20</li> <li>-Podgorsak ch.15</li> <li>-AAPM TG-119: IMRT commissioning; Multiple institution planning and dosimetry and comparison</li> <li>- AAPM TG-120: Dosimetry tools and techniques for IMRT</li> </ul>
19	3/28/2016	Stereotactic Radiotherapy (SRS, SRT, SBRT)	SH	<ul style="list-style-type: none"> <li>-Khan ch.21</li> <li>-Podgorsak ch.15</li> <li>- AAPM TG-42: Stereotactic radiosurgery.</li> <li>- AAPM TG-101: Stereotactic body radiation therapy.</li> </ul>
20	3/30/2016	Total Body Irradiation & Total Skin Irradiation	SH	<ul style="list-style-type: none"> <li>-Khan ch.18</li> <li>-Podgorsak ch.15</li> <li>-AAPM TG-29: The physical</li> </ul>

				aspects of total and half body irradiation therapy. Khan ch.14 -Podgorsak ch.15 - AAPM TG-30: Total skin electron therapy: technique and dosimetry
21	4/4/2016	<b>Laboratory IV: OBI Quality Assurance</b>	SH	- AAPM TG-104: The Role of kV In-Room kV X-Ray Imaging for Patient Setup and Target Localization. - AAPM TG-142,AAPM TG- 58 - AAPM TG179
22	4/6/2016	4D-CT and Respiratory Motion Management	KH	-AAPM TG -76: The Management of Respiratory Motion in Radiation Oncology
23	4/11/2016	-Low Dose Rate Prostate Brachytherapy -Intravascular Brachytherapy	IA	-Khan ch.23 - AAPM TG-137: AAPM recommendations on the dose prescription and reporting methodsfor permanent interstitial brachytherapy for prostate cancer - AAPM TG-149: Dose calculation formalism and consensus dosimetry for intravascular brachytherapy dosimetry.
24	4/13/2016	<b>Laboratory V: Brachytherapy Hot Lab and <sup>125</sup>I Seed Calibration</b>	IA	-Same as for low-dose rate brachytherapy
25	4/18/2016	Electronic Brachytherapy	DJ	- Xofig Manual, publications - TG-152: The 2007 AAPM response to the CRCPD request for recommendations for the CRCPD's model regulations for electronic brachytherapy.
26	4/20/2016	Proton and Charged Particle Therapy-I	HJ	-Khan ch.26 -IAEA 398: Absorbed Dose Determination in External Beam Radiotherapy -ICRU 78: Prescribing, Recording and Reporting Proton Beam Therapy - Harald Paganetti, Proton Therapy Physics, CRC Press, 2011
27	4/25/2016	Proton and Charged Particle Therapy-II (This might include a proton lab)	HJ	Khan ch.26 -IAEA 398: Absorbed Dose Determination in External Beam Radiotherapy -ICRU 78: Prescribing, Recording and Reporting Proton Beam Therapy - Harald Paganetti, Proton Therapy Physics, CRC Press, 2011
28	4/27/2016	<b>Laboratory VI: SRS/SRT equipment, patient and machine QA</b>	IA	-Same as Stereotactic Radiation Therapy - In-house procedures
29	5/2/2016	Task Group Presentations I	IA	AAPM Task Groups

30	5/4/2016	Task Group Presentations II	IA	AAPM Task Groups
<b>31</b>	<b>5/6/2016</b>	<b>Final Exam</b>	<b>IA</b>	