1. **ماجستير الفيزياء الطبية**
2. **يهدف برنامج ماجستير الفيزياء الطبية إلى:**
3. **1. تزويد المجتمع بخريجين متميزين في مجال الفيزياء الطبية.**
4. **2. تزويد الطلاب بالمعارف والمهارات الأساسية ومنهجيات البحث العلمي في مجال الفيزياء الطبية لحل المشكلات الحقيقية في المجتمع.**
5. **3. منح الفرص لتعلم البحث العلمي في الفيزياء الطبية والمجالات ذات الصلة.**
6. **4. تزويد الطلاب بالمزيد من المعرفة والمهارات اللازمة لإجراء البحوث العلمية في الفيزياء الطبية والمجالات ذات الصلة.**
7. **5. تأهيل الطلاب لتحديث وتطوير خبراتهم من خلال تزويدهم بالمعرفة والمهارات المهنية المتخصصة في الفيزياء الطبية ، باستخدام الوسائل التكنولوجية الحديثة للتعلم الذاتي.**
8. **6. يكتسب الطلاب المهارات المهنية المتخصصة لكتابة ونشر البحوث العلمية في الفيزياء الطبية والمجالات ذات الصلة.**
9. **7. تزويد الخريج بأخلاقيات البحث العلمي والمبادئ الأخلاقية والقانونية وأساسيات الجودة في مجال الفيزياء الطبية**
10. .

**هيكل و مكونات البرنامج :**

**(يقبل الطلاب من برامج الفيزياء الطبية - الفيزياء - فيزياء و كيمياء)**

| الكود | نوع المقرر | عدد المقررات | عدد الساعات المعتمدة |
|---|---|---|---|
| Phys600 ف 600 | اجبارى | يدرس الطالب عدد (6) مقررات المبينة فى الجدول | 12 |
| | اختيارى | يختار الطالب عدد (4) مقررات من بين (6) المظللة فى الجدول بواقع مقررين فى كل فصل دراسى | 8 |
| | اجبارى | رسالة الماجستير (اجبارى) | 20 |
| | | اجمالى عدد الساعات المعتمدة المطلوبة | 40 |

| الفصل الدراسى | كود المقرر | اسم المقرر | نظرى | عملى | عدد الساعات المعتمدة | ملاحظات |
|---|---|---|---|---|---|---|
| [illegible] | Phys660 ف660 | فيزياء العلاج الاشعاعى Physics of Radiation Therapy | 2 | - | 2 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Phys661<br>ف661 | فيزياء الاشعة التشخيصية (1)<br>Physics of Diagnostic Radiations (1) | 2 | - | 2 | المقررات الإجبارية |
| | Phys662<br>ف662 | تشريح و فسيولوجى<br>Anatomy and Physiology | 2 | - | 2 | |
| | Phys665<br>ف665 | معالجة الصورة<br>Image Processing | 2 | - | 2 | يختار مقررين |
| | Phys666<br>ف666 | فيزياء صحية<br>Health Physics | 2 | - | 2 | |
| | Phys667<br>ف667 | البيولوجيا الجزيئية<br>Molecular Biology | 2 | - | 2 | |
| الفصل الدراسى الثانى | Phys663<br>ف663 | فيزياء حيوية جزيئيه<br>Molecular Biophysics | 2 | - | 2 | المقررات الإجبارية |
| | Phys664<br>ف664 | فيزياء الاشعة التشخيصية (2)<br>Physics of Diagnostic Radiations (2) | 2 | - | 2 | |
| | Phys650<br>ف650 | الاحصاء التجريبى و النمذجة<br>Experimental Statistical and Modeling | 2 | - | 2 | |
| | Phys668<br>ف668 | بيولوجيا اشعاعية<br>Radiation Biology | 2 | - | 2 | يختار مقررين |
| | Phys669<br>ف669 | قياسات إشعاعية ودوزومترية<br>Radiation Measurements & Dosimetry | 2 | - | 2 | |
| | Phys651<br>ف651 | قياسات ضوئية<br>Optical Measurements | 2 | - | 2 | |

# Contents

## Health Physics Course 666Phys

**Introduction to Interaction of Radiation with Matter**
Beta Particles - Alpha Particles - Gamma Rays - Neutrons

**Radiation Dosimetry**
Units - External Exposure - Internally Deposited Radionuclides - External Exposure: Neutrons

**Biological Basis for Radiation Safety**

Dose–Response Characteristics - The Physiological Basis for Internal Dosimetry - Radiation Effects: Deterministic - Radiation Effects: Stochastic - Radiation-Weighted Dose Units: The Sievert and The Rem

**Radiation Safety Guides**
Organizations That Set Standards - Philosophy of Radiation Safety - ICRP Basic Radiation Safety Criteria - United States Nuclear Regulatory Program - Ecological Radiation Safety

**Health Physics Instrumentation**
Radiation Detectors - Particle-Counting Instruments - Dose-Measuring Instruments Neutron Measurements – Calibration - Counting Statistics

**External Radiation Safety**
Basic Principles - Optimization

**Internal Radiation Safety**
Internal Radiation - Principles of Control - Surface Contamination Limits - Waste Management Assessment of Hazard - Optimization

**Criticality**
Criticality Hazard - Nuclear Fission – Criticality - Nuclear Reactor - Criticality Control - **Required Textbook**

1- Herman Cember, and Thomas E. Johnson, Introduction to Health Physics, Fourth Edition, The McGraw-Hill Companies, 2009.

2- Khan, Faiz M, and John P. Gibbons the physics of radiation therapy, Fifth edition, Lippincott Williams & Wilkins, A Wolters Kluwer Business, 2014.

3- Jacob Van Dyk, The Modern Technology of Radiation Oncology, A Compendium For Medical Physicists And Radiation Oncologists, Library of Congress Cataloging-in-Publication Data, 1999.

# Physics of diagnostic radiation (1) phys 661

1. **Interaction of X-Rays and Gamma Rays with Matter**
2. **Interaction of electrons with matter**
3. **Production of X-Rays**
4. **Radiographic image of the x-ray**

## References:

1. **Physics for diagnostic radiology**
   **Third Edition**

**Pp Dendy, B Heaton**

2. **Diagnostic radiology physics**
   **Hand book (IAEA)**
   **D.R.Dance**
   **S. Christofides**
   **I.D.Mclean**
   **K. H. Ng**

- # Radiation measurements and Dosimetry- Phys 669
- ## Contents
- **- Classification of Radiation.**
- 1. Electromagnetic radiation
- 2. Particulate radiation
- 3. Ionizing and non-ionizing radiations.
- - Stopping power in compounds and mixtures - Linear energy transfer (LET)
- Radiation quantities and Units- Introduction and Overview. Radiation Units
- - Conventional Units -SI Unit - Specific Quantities and Their Associated Units
- - Photon Concentration (Fluence), A Factor in Image Quality
- - Energy, Exposure- Air Kerma- Surface Integral Exposure -Dose Area Product - Absorbed Dose
- -Computed Tomography (CT) Dose Index - Mammography Mean Glandular Dose - Integral Dose - Computed Tomography Dose Length Product - Dose Equivalent - Effective Dose - Tissue Weighting Factors
- ## Dosimetry
- Introduction and Overview- Direct & Indirect monitoring -What is Dosimetry?
- 1. Personal dosimetry
- 2. Indirect monitoring using measured dose rates or airborne concentrations of nuclear substances
- 3. Indirect monitoring using environmental pathways analysis
- 4. Dose Concepts
- About dose limits - Limits on effective doses - Prescribed Effective & Equivalent Dose Limits - External Dosimetry –
- About Dosimeters:
- - General characteristics- Choosing a dosimeter- Dosimeter type testing

- - Dosimetry for photon and beta radiation - Thermoluminescent dosimeters (TLDs)
- Instrumentation for Dosimetry
- - Radiation detectors and dosimeters –
- 1. General characteristics of radiation detectors
- 2. Properties of diagnostic radiology dosimeters - Sensitivity, Linearity, Energy dependence, Leakage Current.
- 3. Ionization chambers
- Clinical application of ionization chambers- Chambers for air kerma (dose) measurements - Cylindrical pencil type chambers - KAP (kerma area product ) chambers
- 4. Semiconductor dosimeters
- 5. Film dosimetry: Radiographic film and radiochromic film
- 6. (OSL dosimeter)
- Dosimetric applications of TLD and OSL- Dosimeter Calibration – Shielding Gamma Rays & Exposure Rate- Basic principles of radiation protection - Gamma Rays Attenuation & Half Value Layer - Solved Examples
- **References**
- - Radiation detection and measurement - Knoll - Cited by 17365
- - Radiation Dosimetry: Physical and Biological Aspects - C.G. Orton
- - Introduction to Radiation Protection Dosimetry - Baoshan Weng & Jozef Sabol

# Phys. 650: Experimental Statistics and Modeling

## Contents

3.3. Linearization and Stability
3.4. Positive and Negative Interactions
3.4.1. Competition model
3.4.2. Immune system vs. infective agent
3.4.3. Mutualism model

## References


1. Allman E. S., Rhodes J. A., ***Mathematical Models in Biology: An Introduction*** (Cambridge University Press, Cambridge, 2004)
2. Murray J. D., ***Mathematical biology: An introduction***-3rd edition (Springer-Verlag, Berlin, 2002)


**Course Title: Image Processing -Phys 665**

**Course content:**

• Introduction - Elements of digital image processing - Image model - Sampling and quantization - Relationships between pixels

• Image Transforms - Discrete Fourier Transform - Discrete Cosine Transform - Haar Transform - Hadamard Transform

• Image Enhancement - Enhancement by point processing - Spatial filtering - Enhancement in the frequency domain - Color Image Processing

• Image Segmentation - Discontinuity detection - Edge linking and boundary detection - Thresholding - Region oriented segmentation

• Representation and Description - Boundary description - Regional description

• Morphological Image Processing - Dilation and Erosion - Opening and Closing - Some basic morphological algorithms - Extensions to gray level images

**Module references –**


R. C. Gonzalez and R. E. Woods, "Digital Image Processing". Pearson-Prentice-Hall, 2008.

- Al Bovik (ed.), "Handbook of Image and Video Processing", Academic Press, 2000.

- A.K. Jain, "Fundamentals of Digital Image Processing", Prentice-Hall, Addison-Wesley, 1989.

- M. Petrou, P. Bosdogianni, "Image Processing, The Fundamentals", Wiley, 1999.

- P.Ramesh Babu, Digital Image Processing. Scitech Publications., 2003

- Bernd Jähne, Digital Image Processing, Springer-Verlag Berlin Heidelberg 2005.

- B. Jähne, "Practical Handbook on Image Processing for Scientific Applications", CRC Press,1997.

- J. C. Russ. The Image Processing Handbook. CRC, Boca Raton, FL, 4th edn., 2002.

- J. S. Lim, "Two-dimensional Signal and Image Processing" Prentice-Hall, 1990. - Rudra Pratap, Getting Started With MATLAB 7. Oxford University Press, 2006

- W. K. Pratt. Digital image processing, PIKS Inside. Wiley, New York, 3 rd , edn., 2001.

- Stephane Marchand-Maillet, Yazid M. Sharaiha, Binary Digital Image Processing, A DiscreteApproach, Academic Press, 2000

**Course name: Optical Measurements 651 Phys**

- Course main subject: Colour measurements
- Course subtitles :

1 – Colour Perception
2 – Colour Measurement
3 – Colour Scales
4 – Surface Characteristics and Geometry
5 – Sample Preparation and Presentation

- References:

1 – www.hunterlab.com

2 – G. Wyszecki and W. S. Stiles, "*Colour Science: Concepts and Methods, Quantitative Data and Formulae",* 2nd ed. (John Wiley & Sons, New York, 1982).

## Physics of diagnostic radiation(2) phys 664

1. Tomographic Imaging with X-Rays
2. Diagnostic Imaging with Radioactive Materials
3. Diagnostic Ultrasound

References

3. Physics for diagnostic radiology
   Third Edition
   Pp Dendy, B Heaton

4. Diagnostic radiology physics
   Hand book (IAEA)
   D.R.Dance
   S. Christofides
   I.D.Mclean