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FACULTY OF RADIOGRAPHY & MEDICAL IMAGING SCIENCES

Undergraduate & Graduate

PROSPECTUS

National University - Sudan

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Welcome

Note from The President of NUSU

[www.nu.edu.sd]

01

This is the 5th Edition of the PROSPECTUS of the National University-Sudan (NUSU). In this document registered students will find information about the mission, vision and values of NUSU, and all programme details and activities. This edition includes both UNDERGRADUATE and GRADUATE course outlines. NUSU aims at high-class education in medical, technological and social sciences. This is reflected in this comprehensive outline. It describes the basis of NUSU's educational philosophies, programme objectives including the characteristics of the graduate, strategies and methods, degree structure, semester duration and credit hour load, and brief outline of content. This represent a narrow window into the complex organization of NUSU. More information on the rationale of modules, behavioural objectives, and assessment can be found in the curriculum of each Faculty. The calendars, year plans and timetables are issued for each semester with the exact dates for teaching sessions, other learning opportunities, assessment, feedback, and holidays.

NUSU is now 19 years old. It is still developing, and trying to set traditions of availing all activities in its publications, that may remain relevant for 3-4 years, before new editions are issued. The councils and committees of NUSU, while compiling this, are drawing their experience from lo-

cal and worldwide, up-to-date educational practices. Concurrently, other documents (Student Manual, Staff Handbook, Induction packages, and policies and procedures) are re-written and updated, in view of the emerging concerns about student welfare, environment, students with special needs, and virtual online educational resources.

There is a strong focus on synergy between modern education, developmental needs, and employment market requirements. This has laid down a wide area of maneuvers in the choice of specific disciplines and modules. In each discipline, a detailed career advice has been added in this edition to show students the opportunities available if they choose to be employed or opt to start their own business to employ others.

The reputability of NUSU has attracted students from about 25 countries and all continents. This representation requires quality of premises and services, as well as understanding of diversity, inclusiveness, and considerations for non-discrimination in the educational activities and campus life. International students and the Sudanese students whose families are living outside Sudan, receive special induction, supervision, and directives by the Deanship of Student Affairs, and regular courses shown in this prospectus as Sudanese Studies.

It is my pleasure to invite all qualified students to join NUSU's exciting new and innovative educational programmes. Students, parents, and sponsors are welcome to visit the campus. They will receive guidance from the HELP DESK at the Main Gate. They will be escorted to buildings and connected with the leadership of the university or faculties. Our primary target is to create guest satisfaction. Your comments and feedback are important for us to continue improvement to meet our goals.

Last, but not least, we would like to invite our higher education colleagues, inside and outside the Sudan, to read this publication. Our special request: please have a critical look at this and show us our faults. You may suggest means of correcting them, and tell others about the positive and bright spots of this attempt. Your advice will be highly appreciated.

Prof. Qurashi M. Ali PhD, MD, FRCPE
President, National University, Sudan

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ACKNOWLEGEMENTS

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Worldwide, the overall innovations and their modifications stem from the efforts of Professor Bashir Hamad. Every page of our documents could not be finalized, or brought to fruition, without his fatherly approval and comments or traces of his educational spirit. His direct and indirect contributions to the curriculum of this University and continuous encouragement are gratefully acknowledged, particularly those related to educational strategies, instruction, and evaluation. The following have reviewed and reorganized the final versions of this prospectus: Prof. A/Rahman Eltom MD,PhD, Prof. A Rahman Biri MD FRCP, Prof. Elthami Abdul Mageed PhD, (medicine), Hassan M. Ali PhD, Dr. Ahmed Abusham PhD and Dr. Salah Ibrahim PhD, and Dr. Fatma Mukhtar MSc. (pharmacy), Dr. Kamal Khalil MD.Dr. Elfatih A Mageed MD (physiotherapy), Dr. M. A. Siddiq PhD. Prof. Awad Haj Ali PhD. (computer and health informatics program), Prof. Ibrahim Ghandor and Dr. Abdalla Darous, Dr. Enas Badawi PhD, Dr. Arif Affan (dentistry), Prof. Sayda H. Elsafi MD, PhD and Dr. Nihal Mirza MD, Dr. M. Sirelkhatim, Dr. M. Abdelgadir, Dr. Maha Magoub (medical laboratory sciences), Dr.Abdel Moneim Saeed PhD, Dr. M. A. Elsheikh PhD Dr. Elsir Ali Saeed PhD, Dr. M. Elfadil PhD, Prof.Maha Esmeal (imaging technology), Prof. Awatif Ahmed PhD, and Ms. Fatma Bhruddin MSc, Dr. Sumia Ibrahim PhD (nursing and midwifery), Prof. Salih Faghiri PhD, Prof. Omer Elmagli PhD, and Prof. Hassan Kamal PhD, Dr. M. A. Osman, Dr. Mutaz Suliman, Dr. A Azim Almahal PhD, and Prof. A Gadir M. Ahmed PhD (management sciences). The contributions of Dr. Nadir Hasanain {Engineering) , Prof. A Latif Elboni and Dr. Ibrahim Mirghani (International Relations) are outstanding.The list, of those who, knowingly or unknowingly, contributed curricular details or ideas registered in Editor's memory or documents, is exhaustive. Our thanks are to the following professors: A/Hameed Lutfi, M.Y. Sukkar, Elbagir Ali El Faki, Amir El Mubarak, Omar Abdul Aziz, Othman Taha, Othman Khalafalla, Ali Habbour, Omar A. Mirghani, Awadelseed Mustafa, Mubarak Majzoub, M. Awadalla Salih, Hafiz El Shazali, Jaafar M. Malik, Othman Hamour, Ali Karar, A/Alla A/Wahid, El Tayeb Abdul Rahman, Eisa Othman El Amin, Mamoun Homeida, Hassan M. Ahmed, Ali Abdul Rahman Barri, Ibrahim M. A/Rahim, Ahmed A. Muhammadani, Mukhtar El-Khatim, A/Rahman A/Hafeez, Sayed M. Ahmed, Awad A/Rahman El-Awad, M. Elamin El-Sharif, Kamal Zaki, A/Rahman El-Tom, Ghazi Salahuddin, Bakri Osman Saeed, Mohyddin Majzoub, Jamal Suleiman, Abbas ElKarib, ElGamri ElRadi, Salah M. Omer, Majid Mustafa, Muzamil Hassan A/Qadir, M. A/Rahim A/AAl, Khalid Musa, Bakri Musa Abdul Karim, Tahir Othman Ali, Omar Siddiq, Fathel Rahman Ahmed Ali, A.Moneim Sahal, Omar Habbal, Mickell Seefldt, Ara Tekian, Margaret Uguroglu, Saleh A. Al Damegh, Zeinel Ab-

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Most of the "Dentistry Curriculum" has been adapted, with permission, from experts all over the world, mainly deans and heads of departments in the Sudanese dental colleges, and institution in dental sciences. The outstanding effort of professors Ibrahim Ghandour, Yahya Eltayeb, Ibrahim Elkamil, Osman Elgindi, Ahmed Suliman, Abbas Ghariballa, Nadia A. Yahia, Elnur Ibrahim and the improvements made by Enas Badawi, Eman Khair, and Suha A/Gadir is gratefully acknowledged.

The Engineering curriculum has been designed by committees headed by Dr. Nadir Hasanain as dean and head of civil department, and valuable contributions by Prof. Seifeldin Sadig. The International Relations and diplomatic studies curriculum has been written first by Dr. Ibrahim Mirghani and has been edited and adapted to the national requirements by Prof. A Latif Albouni and Bakri A/Karim.

The whole idea could not have seen the light without the encouragement of the Investors' Corporation and Board of Trustees of the National University, who spend days every week responding to routine and emerging issues of financing. On their behalf, I would like to thank the genius and friendly contribution of Mr. Zahir Twahry for his artistic preparation of the 3rd and 4th editions and other NUSU publications. The final editing of most of the undergraduate manuscripts has been skillfully and patiently carried out by Prof. A Rahman Osman Beeri Former Secretary of Academic Affairs. The graduate prospectus has been compiled by Prof. M. M. A. Abulnur, Dean of Graduate Studies and Scientific Research, and Dr. M. Abd Al Kader and Dr. Hatem Al Rufaai.

WHAT IS THE NATIONAL UNIVERSITY?

03

1. MISSION, VISION AND VALUES

The **VISION** of the National University is to be a world-class leading provider of private higher education in the Sudan, in the aspects of elegance of environment and structures, excellence of curricula and learning strategies, quality of management systems, commitment of investors and employees to customer satisfaction (students, relatives, and regulators), distinguished graduates in academic achievements, general ethical standards, and concern with professionalism and original research production.

The **MISSION** is to: (1) constantly strive to provide efficient and best-in-class professionals, in their specialties, (2) meet and exceed our customer needs and expectations, and (3) stay ahead of the competition by creating safe and rewarding workplace facilities and innovating new quality output, services, and relationships in transparent, honest, and fair business.

The **VALUES** are : (1) obligations to treat the public and one another with personal and professional integrity, consideration, and mutual respect, (2) commitment to honesty, truthfulness, respect for human dignity, and professional ethical behaviour, (3) fair treatment of all citizens and employees, with no discrimination on the basis of morphology or ideology (4) promotion of democratic values, hard work, perseverance, commitment to success, accepting responsibility and accountability for one's conduct and obligations, and (5) creating and maintaining a respected reputation and positive image in the community as a trusted partner through excellent care of the individual and family, and responsibility towards the community and environmental problems and concerns.

2. DOCUMENTS

The legal documents of the University include: (1) the University Charter, (2) Academic Regulations (3) Rules of Activity and Conduct (4) Study Fees' Regulations, (5) Employment Regulations, (6) National Employment Penalty Regulations, (7) Contracts and Salary Scale, (8) Job Descriptions, (9) Staff Handbook, (10) Students' Manual, (11) Quality Manual, (12) Teaching, Learning and Assessment Policy, (13) Prospectus and Curricula, (14) Organizational Chart, (15) Committee Structure, (16) Logbooks of students' skills and activities, (17) Year Plans, (18) Academic Calendars, (19) Programme Evaluation Forms, (20) Portfolio of Architectural and Structural Designs of Buildings, (21) External Examiners' Appointment, Reporting and Response documents and (22) numerous policies and procedures in areas of quality, safety, and non-discrimination.

3. BOARD OF TRUSTEES

The Board of Trustees (BOT) is formed according to the Charter to include the investors, the academicians, the representative of the Ministry of Higher Education, and public figures of interest in education or eminent individuals involved in social accountability issues of universities. The current BOT is chaired by Dr. Taha Eltayeb A. Elimam, and includes in its membership: Prof. Qurashi M. Ali, Dr. Amin O. Sidahmed, Dr. M. Sirelkatim Ali, Prof. A-Rahman Osman Beeri, Prof. Osama A-rahman Elamin, Eng. M. Awadelkarim Elgasim, Dr. Saad Subahi, Dr. Elhadi Bakheet, Eng. Yousif A. Yousif, Prof. A-Moneim Algousi, Dr. Ismail Qurashi, Prof. Hassan M. Ali, Deans of faculties, and representatives appointed by the Ministry of Higher Education and approved by the President of the Sudan.

4. RIGHTS

4.1 GENDER RIGHTS

Throughout this manual (and the webpage) every effort has been made to use he/she, his/her, him/her. It may not be possible to assure that this fair use has been consistent. Any such unintended mistake should be taken to mean both sexes. Females have been addressed in situations of special concerns, in gender-specific issues, mainly out of respect for their specialized roles.

4.2 EXCLUSION OF LIABILITY AND DISCLAIMER

Throughout this manual (and the webpage) every effort has been made to ensure that expert, accurate, and up-to-date guidance has been included. The administrative and academic authority continuously updates the NUSU data and academic regulations to satisfy the emerging needs, more quickly than publications would reflect. Approved changes are shown at the official noticeboards of the University. Accordingly, neither the Ministry of Higher Education, nor the NUSU administration, shall be liable to any person or entity with respect to any loss or damage caused or alleged to be caused by the information contained or omitted from this manual (or the webpage).

4.3 COPYRIGHTS

a. The curriculum timetable and course details resemble many of those (or may contain parts) in other colleges in which the "President of NUSU" has been the main or essential member in the bodies responsible for curriculum design and evaluation. In many institutions he has been one of the driving forces for innovation. These institutions include: University of Gezira (Sudan), Sultan Qaboos University (Oman), Omdurman Islamic University, Alzaeim Al-Azhari University, University of Medical Science and Technology, African International University, National Ribat University, Al-Razi University (Sudan), and Al Qassim University (Saudi Arabia). Major innovations have been added to improve on the experience of the above institutions. This manual (and the webpage), in addition to comprehensive compilations in each program document (to be given to each student) is an entity of its own. Therefore, the total set of details, which is not available in any other institution so far, may not be

copied or published without written permission from the National University- Sudan.

b. The teaching material available in the webpage, and other published material in the University notes, is original and should not be reproduced for commercial use, in any form without written permission of the National University- Sudan. Non-profitable teaching purposes are allowed. Our teachers and colleagues, who are mentioned in the "Acknowledgements", are free to use this material because it is all from them, we could not single out what is ours from theirs.

5. ENTRANCE REQUIREMENTS

A. Applications must be through the Ministry of Higher Education (Sudan) Admission Directorate, based on passing a fresh Sudan (or equivalent) School Certificate or equivalent qualification (please see relevant booklets provided at that office). Older 5-10 years' School Certificates may be considered, if vacancies are there, and details are approved by the Admission Office. The newly introduced online application dismiss disqualified applicants automatically.

B. Direct applications are welcome, but will be entered online by the University to the Admission Directorate for approval.

C. International applications will be processed similarly, but candidates are advised to follow the application procedure in the webpage, and wait for a response, before arriving in the Sudan. The NUSU Administration takes 5 working days (after receipt of application) to finalize acceptance. Electronic communication is preferred. For security reasons. A student who is granted acceptance by the NUSU will NOT be allowed by the Ministry of Internal Affairs to transfer to any other university after arrival, except after studying and passing, at least, one academic year..

D. Mature students qualified with a previous health science professional degree may be considered. In this case early application is recommended (6 months before national intake in September every year), because of the time it may take for the approval of the School Certificate by Ministries of General Education and Higher Education, Sudan.

E. Final decision on acceptance depends on the results of an interview to confirm if the student has the aptitude to join a specialty, and is free from physical and psychological inabilities that are not compatible with the responsibilities of a specific or hardship profession. But individuals with special needs are welcome and will find NUSU a conducive environment of values against discrimination.

F. Transfer NUSU from other universities may be considered for enrollment in Semesters 2, 3, 4 or 5 only, based on the approval of the General Directorate of Admission in the Ministry of Higher Education.

6. STAFF AND RECRUITMENT

Academic and administrative staff interested in joining the National University-Sudan, may show their intention by filling the e-recruitment form included in the webpage. A response will be sent

by e-mail within 48 hours, and further instructions will follow. Appointment of academic staff is based on academic excellence in the areas of research and teaching. Academic applicants with no research records or grants will not be considered for full-time positions in this university. Full- and part-time staff list may be looked up in Academic Staff section of the webpage.

Applicants interested in joining other private educational institutions in the Sudan can reach them through our web-page. The employment conditions and salary scale are not (currently) available in this manual or website.

7. LOCATION AND MAPS

A. The Country: The best advantage of this National University is that it is located in Sudan, an Afro-Arab country with rich human and natural life resources. The inhabitants are either Arabs or Africans.. The Sudan educational institutions are known, worldwide, for their academic excellence, ethical heritage and professional teaching perfection. A Sudanese national, wherever he/she may be is unique in considerateness, courtesy, and hospitality. In almost 80% of the country, it is the safest in the world. A single lady can jog in Khartoum, or any other city, in the middle of the night unbothered. Sudanese abide voluntarily by strong moral codes and respect for females as foreigners. The media-nourished concepts of North-South or West-East conflicts have largely exaggerated the reality. The color of people has no significance in this country, maybe the only country in the world where color has never and can never be a real cause of conflict. Media are prototyping other countries' dilemmas on a local setup that has got some developmental problems. It is interesting that the Arabs in this country are mainly non-white, and the non-Arabs are not necessarily black, contrary to what the media have publicized. The luckiest person in the world, any moment, is the one who has been received by a Sudanese host.

Prot Sudan

Khartoum

B. The City: The capital is Khartoum, a city made up of three cities striding the White Nile, Blue Nile as they join to form the River Nile. This has given it unique panoramic landscapes and scenery. There are about 4-6 million inhabitants, mostly in traditional houses, known for their spacious yards. Khartoum city is the official capital crowded with governmental offices, ministries, embassies and international organizations. There are some affluent districts where the price of a house may be as expensive as in New York or Tokyo, and other areas of modest housing. Therefore students have a wide range of choice. Transportation used to be a problem, now it is quite easy, but still, students are advised to find accommodation as near as possible to the University premises.

C. Premises and Environment : (See map). The National University permanent building is located in the Eastern part of Khartoum called Al Raqi District, near the Khartoum-Medani Highway, in an affluent newly established residential area. This region has an interlacing and frequent network of transport, yet the wide roads give no impression of crowdedness, or noise pollution. This accessibility is an invaluable asset for an educational institution. The University block, a purpose-built structure, assumes a masterpiece of architectural innovation (see pictures). The National University is open to students and staff for 18 hours on weekdays and 6 hours on weekends. The library, self-directed learning facilities are available for registered students and staff. Limited access to research laboratories is allowed for certain students who are involved in staff's research projects. Certain sport facilities (Basket- ball and volleyball) are within the premises. In-door recreational facilities are available in the Cafeteria. The source of pride for the University is the design of its beautiful, environmentally friendly, and durable facilities that support its mission. Students and employees are expected to respect and work towards achieving that. Directives from them to their visitors are very important to maintain and improve the level of standards of perfection we intend to reach. There are few similar, or near, buildings of excellence of space and quality, so far, in higher education institutions in the Sudan.

   A 10-floor teaching hospital building stands next to the main University block and accommodates over 300 beds with full tertiary care facilities. A 5-floor building accommodate the Faculty of Engineering. NUSU owns a 35000 M2 area in Albagair Suburban Area, in which a new campus is being built. It includes a rural hospital.

8. PROGRAMME FEES

A list of tuition fees is published by the MHESR every year. Private institutions keep updating such list, but a student accepted in one particular academic year will NOT be charged with the fees published for fresh students. Fees cover teaching and administrative activities of the University including laboratories and in-campus training. Accommodation and food subsidies are NOT included. Transportation to and from the University or off-campus training sites is NOT included, but the University tries to provide that for selected activities. Additional fees are variable for compensations of absence or failure. Students pay for all courses Training outside the campus and examinations [substitute or supplementary], scheduled in the Summer or Holidays, based on the credit hour load of the courses. Fees for such compensations are usually not published in Academic Calendar, but requested by students or their sponsors.

Background

The radiography and medical imaging programme was launched in 2006 under the then-National College for Medical and Technical Studies. It follows a semester system over four years, totalling eight semesters plus optional summer units. The initial semesters cover preparatory and shared general sciences, followed by specialisation from semester 4 through 8.

NUSU leads in adopting modern educational techniques in radiographic training in Sudan, including problem-based learning (PBL), seminars, field placements, hospital clinical practice, and research assignments, based on recognised national standards and ISO-9001-2008 certification.

In 2016, NUSU received full accreditation from the British Accreditation Council (BAC) for three years, becoming the first and only Sudanese higher education institution internationally accredited by BAC. BAC accreditation involves a comprehensive external evaluation of: Institutional governance and administration, Teaching and learning quality, Student welfare and support and Premises and facilities standards. This international certification added a layer of external validation beyond local approvals, enhancing the credibility of all programmes, including radiography and medical imaging, on a global stage. While there's no separate faculty-level BAC registration, the radiography programme benefits from its inclusion within the wider institutional accreditation. Quality assurance: BAC accreditation promotes ongoing evaluation, curriculum updates, and alignment with international teaching standards. Global visibility: Credentials from a BAC-accredited university are more recognisable when graduates seek further studies or professional recognition abroad. Institutional credibility: As a whole, NUSU's BAC status reinforces trust in associated faculties, including Radiography & Medical Imaging, contributing to broader academic and clinical partnerships.

Our Vision

To be a leading center of excellence in radiography and medical imaging education, research, and clinical practice, producing globally competent professionals who advance diagnostic

healthcare, contribute to scientific innovation, and enhance community wellbeing. The vision emphasises academic and clinical excellence, leadership in diagnostic imaging sciences, global relevance with local impact, and a culture of innovation and continuous improvement in healthcare.

Our Mission

Our mission is to provide high-quality education, research, and clinical training in radiography and medical imaging to develop competent, ethical, and innovative professionals who advance healthcare services and diagnostics locally and globally.

Our Values

The following principles are explicitly emphasised in radiography and imaging science contexts:

- Professional integrity embodies honesty in patient care, teaching, research, and collaboration, consistent with university ethics.
- Ethical patient-centered care involves treating patients and families respectfully, maintaining confidentiality and aligning with national ethics codes.
- Scientific excellence & diligence, uphold high standards in imaging science education, research rigour, and clinical practice.
- Equity & inclusiveness serve all communities, including rural and underserved areas, without bias.
- Innovation & lifelong learning encourage continuous improvement, creativity, and adoption of new imaging technologies and methodologies.
- Social responsibility involves engaging with community health initiatives, encouraging participatory planning, and addressing cultural and environmental needs.

Our Objectives

The objectives of the National University-Radiography and Medical Imaging Science Programme are to:

- Preparing qualified graduates in the field of medical imaging technology to satisfy the needs of the employment market and development plans.
- Providing students with theoretical knowledge and practical applications in various aspects of radiological and imaging techniques
- Qualifying students with the technical skills necessary to operate sophisticated diagnostic imaging equipment, as well as those for simple maintenance and troubleshooting.
- Providing knowledge, skills and attitudes needed to administer diagnostic medical imaging units, and satisfy the requirements of quality control.

- Acquisition of professional ethics and teamwork approach.
- Provision of theoretical and practical information needed for involvement in research and evidence-based imaging.
- Development of self-education skills that qualify students for further education, including graduate studies and self-directed learning.

The Curriculum Objectives

- A graduate of the Faculty of Radiography and Medical Imaging Program should be able to:
- Adopt the strategies of the National University- Sudan and abide by its objectives, rules and regulations stated in the Order of Establishment (NC-Docs-8/1, dated January 2005, updated 2008).
- Observe, in his/her practice, the health professional ethics which agree with the Nation's values, beliefs and norms as stated by the Sudan Allied Health Professions' Council, and maintain good and honest relations with her/his patients, their families, his/her colleagues across all sectors involved in health.
- Integrate basic, technical, clinical nursing and laboratory sciences in solving imaging problems of the individual relevant to radiological sciences and practice.
- Use scientific knowledge in radiology and imaging, according to known methods of problem solving and integration, and show understanding of the scientific structural (anatomical),functional (physiological, biochemical), morbid (microbiological, pathological), and technical (physics and equipment) therapeutic (pharmacological) background related to the problem.
- Attend professionally when imaging a patient with an emergency or multiple trauma and perform life-saving procedures and critical care, and decide and act properly on cases needing consultation with colleagues or referrals to specialised centers or personnel.
- Show patience and tolerance when sitting and/or standing for a relatively longer time in doing work, especially in patient or unit conditions, well beyond working hours.
- Handle chemical, biological and dangerous materials or ionising radiations with caution and safety using the scientific approaches stated in procedures for dealing with these materials or radiations.
- Interact with the patient and family in a friendly and humane manner. Perform the medical history and physical examination according to the standard scheme.
- Ensure that responsibilities for patient hygiene, injury prevention, and vital sign recording are carried out according to the prescribed procedures.
- Obtain radiographs or other images from patients in a timely and professional

manner, considering the technicalities and limitations of the machines in use.

- Accept to work in all settings, urban or rural, served or under-served, according to needs, and acts to improve health service delivery systems both quantitatively and qualitatively.
- Encourage community participation in patient and community health and help in recruiting various sectors in defining relevant health-related problems, planning and providing suitable imaging solutions, recognising the community beliefs, ethics and traditional practices.
- Adhere to the "health team" approach, acting as an efficient member, accepting labour and responsibilities given to its members, and promoting both effectiveness and homogeneity among members.
- Continue to consider elements of efficiency, costing and economic implications in her/his radiological and imaging interventions.
- Acquire the skills of teaching, learning and communicating efficiently to carry out her/his duties in health education, explaining procedures to patients and in winning the confidence of them and their families.
- Show respect to patients, supervisors, and colleagues, using satisfactory communication with them and maintaining confidentiality at all levels of communication and care.
- Acquire the skills of independent learning and contribute to availing opportunities for planning and implementing continuous educational activities to upgrade her/his abilities and those of her/his colleagues in the health team, benefiting from information technology.
- Carry out health or health-related research in imaging, alone or with other members of a team in health or other relevant sectors, particularly medical physics and quality control, using known and approved scientific methods.
- Use computers in word processing of (both Arabic and English), presentations, spreadsheets, statistical packages and graphics to achieve success in other objectives of her/his career.
- Acquire a postgraduate qualification in the discipline of her/his choice, recognising the needs of society for certain specialities, particularly emergency and critical care imaging, trauma imaging, radiation protection and imaging choices in primary health care.

Educational Strategies

As stated in the Academic Regulations, the learning strategies emphasise the following: (1) early acquisition of basic skills, (2) student-centered learning, and maximum student responsibility in the learning process, (3) problem-based and problem oriented instruction, (4) communi-

ty-oriented and community-based activities, (5) integration of basic science, community and clinical practice, in a multidisciplinary approach, (6) self- and peer- education and evaluation, wherever relevant, (7) team-work attitude, (8) a range of elective modules, (9) continuous evaluation, (10) preparation for continuous professional development.

Instructional Methods

The Faculty adopts the following methods in the daily programme of activities:

(1) problem-based learning (PBL) sessions- one problem/ week at most, (2) seminars and small group discussions, once/ week at least (3) field practice in rural and primary health care settings and societies not less than 1/5th of the timetable, (4) practical sessions (laboratory, clinical, pharmaceutical industries) not less than 1/4th of the curriculum timetable, (5) skill laboratory (weekly) sessions, (6) lectures -not more than 1/3rd of the curriculum timetable (not more than three lectures/day). (7) Educational assignments, reports and research activities (as many as the program would allow- at least one per module), (8) electives -not more than 10% of the curriculum timetable, and (9) graduation project.

Evaluation

Short modules (three weeks or less) are evaluated on the first Saturday following the last session of instruction through best answer MCQs, brief answer questions and problems. Continuous assessment should include attendance, contribution, coordination, assignments and seminars. Practical examination (if relevant) should be arranged during the course of instruction or on the Wednesday/Thursday that precedes the theoretical examination on Saturday. Unless the dean and coordinators justify an exception and permission, the regulations of the faculty do not consider oral examination as a fair means of assessment; however, it is often indicated in imaging sciences and practice.

Longer modules (four weeks or more) are evaluated by mid-course and end–of–course examinations. The former should not account for more than 20% of the total marks. The theoretical examination of either is done on the mid- and final Saturday of the module. Other details (as in short modules) are the same.

Administration

Prof. Mohamed Elfadil Mohamed Garelnabi
Faculty Dean
Professor of Medical physics & Imaging, Medical Ultrasound and Radiation therapy
Prof. Maha EsmaeelAhmed
Deputy Dean
Professor of Radiography and Medical Imaging
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Semester 1 [24 CHs- 19 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Orientation week	-	-	-	-		-
2	Scientific English 1	ME-ENG-113	Long	3	-	-	3
3	Radiation Physics 1	RAD-PHYS-125	Long	3	-	2	4
4	Biostatistics	ME-STAT-117	Long	2	-	-	2
5	Computer Science 1	ME-COMP-116	2	2	-	1	2
6	Introduction to Medical Ethics	ME-ETHIC-226	Long	1	1	1	2
7	Physics for Medical Equipment & Investigations 1	ME-PHYS-115	Long	3	-	-	3
8	Medical terminology 1	P-TERM-127	Long.	3	-	-	3
9	Human Body Structure & Function (introduction-Anatomy & physiology)	PT-NAT-126	Long	2	2	2	5
Total				19	3	4	24

Semester 2 [23 CHs- 12 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Medical Terminology 2	RAD-TERM-215	2	2	-	-	2
2	Scientific English 2	ME-ENG-123	Long	3	-	-	3
3	Basic Biochemistry	ME-BIOCH-118	3	2	-	1	2
4	Computer Science 2	ME-COMP-124	2	2	-	1	2
5	Mathematics and Calculus	RAD-CALC-120	2	3	-	-	3
6	Introduction to Medical Imaging & Medical Education	ME-EDU-114	Long	2	-	-	2
7	Musculoskeletal System	RAD-ANAT-223	Long	2	1	2	4
8	Radiation Physics 2	RAD-PHYS-125	3	3	_	-	3
9	Behavioral Science	ME-BEHAV-129	Long	2	-	-	2
Total			12	21	1	4	23

Examination of longitudinal courses (+re-sits) 2 weeks

SUMMAR 1: Medical records and data collection (ME-SUM-131) 2 CHs Elective (E-132): A 1000 –word report on "Internet Sources of Health Sciences" 1CH

FIRST YEAR PROGRAMME EVALUATION

Semester 3 [25 CHs- 17 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Radiobiology	RAD-BIO-412	Long.	3	-	-	3
2	Gross anatomy (Regional 1)	RAD-ANAT-212	4	2	1	2	4
3	Introduction to Radiography 1	RAD-RAD-214	2	3	-	1	3
4	Diagnostic Imaging Equipment 1	RAD-EQUIP-213	2	2	-	1	2
5	Patient Care in Imaging	RAD-CARE-313	2	2	-	-	2
6	Radiographic Technique & Procedures 1	RAD-TECH-216	Long.	3	-	2	4
7	Man & Environment(Imaging Physiology)	ME-MRPHY-311	5	4	1	1	5
8	Professional Skill 1 (Nursing)	RAD-SKILL-221	2	2	-	-	2
	Total		17	21	2	7	25

Examination of longitudinal courses (+re-sits) 1 week

Semester 4 [21 CHs- 18 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Diagnostic Imaging Equipment 2	RAD-EQUIP-225	3	3	-	-	3
2	Introduction to Radiography 2	RAD-RAD-222	2	2	-	-	2
3	Computer in Medical Imaging	RAD- COMP-314	2	3		-	3
4	Gross Anatomy (Regional-2)	RAD-ANAT-223	3	2	-	2	3
5	Radiographic techniques & procedures 2	RAD-TECH-224	Long.	2	-	-	2
6	Nuclear Medicine Physics and Technique	RAD-NUCPHY-229	3	2	1	1	3
7	Principles of Diseases (Pathology)	ME-DIS-212	5	4	1	1	5
	Total		18	18	2	4	21

Examination of longitudinal courses (+re-sits) 1 week

SECOND YEAR PROGRAMME EVALUATION

Semester 5 [23 CHs- 18 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Radiographic Anatomy	RAD-ANAT-318	Long.	1	-	2	2
2	Special procedures- Advanced Techniques-1	RAD-ADTEC-317	Long.	2	-	1	2
3	Ultrasound Physics	RAD-SON-217	2	2	-	-	2
4	CT physics	RAD-PHYS-222	3	3	-	-	3
5	Cross-sectional Anatomy	RAD-ANAT-316	3	2	-	-	2
6	Basic Radio-pharmacology	RAD-PHARM-319	3	3	-	-	3
7	Radiographic Pathology	RAD-PATH-312	3	4	2	-	5
8	MRI Physics	RAD-MRPHYS-311	2	2	-	-	2
9	Quality Assurance	RAD-QA-328	2	2	-	-	2
Total			18	21	2	3	23

Examination of longitudinal courses (+re-sits) 1 week

000 work essay on management of an emergency 1CH

THIRD YEAR PROGRAMME EVALUATION

Semester 6-8 – Clerkships or Hospital Department Rotations=76 CHs

Four semesters, 16 modules of four major rotation, five longitudinal courses including two elective

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Multidisciplinary clinical practice clerkship	RAD-CLIN-322, 323 & 324	Long.	1	-	10	6
2	Professional skills-2 (inter-ventional-radiology)	RAD-SKILL-311	Long.	2	-	1	2
3	CT techniques and Protocols	RAD-CT-TEC-326	2	2	-	-	2
4	Ultrasound techniques	RAD-SON-325	3	3	-	-	3
5	MRI techniques and Protocols	RAD-MRI-327	4	2	-	-	2
6	Advance Technique-2	RAD-ADTEC-411	5	2	-	-	2
			14	12	-	11	17

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Radiation Protection	RAD-PR-218	3	2	-	1	2
2	Clerkship Department Rotation	RAD-CLIN-414	Long.	-	2	10	6
3	Case Studies	RAD-EVID-415	Long.	2	2	2	4
4	Radiotherapy	RAD-THER-413	4	2	-	-	2
5	Advanced Ultrasound Techniques	RAD-SONO-416	4	3	-	-	3
6	Management of an Imaging Unit	RAD-MA G-329	3	2	-	-	2
8	Introduction to Research	ME-RES-227	4.	2	-	-	2
			18	13	4	13	21

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Films review & interpretation	RAD-REV-424	4	2	-	1	4
2	Clerkship department rotation	RAD-CLIN-322, 323,324, 414, 423	Long.	-	2	10	6
3	Professional Trip	ELECTIVE	-	-	-	-	-
4	Graduation project and seminars	RAD-GRAD-421, 422	8	2	-	-	6
			12	4	2	11	16

Total credit hours = 170

Rotation of the groups is as follows:

Semester 6 = A B C

Semester 7 = B C A

Semester 8 = C A B

CLERKSHIP EVALUATION AND GRADUATION

COURSE OUTLINE

Detailed behavioral objectives, skills, assignments and problems are listed in each course book. The lists are too extensive to be included below:

Phase 1: Semester 1, Preliminary Courses

Title	Code	Semester/Duration	Credits
SCIENTIFIC ENGLISH	ME-ENG-113, ME-ENG-123	1and 2/Longitudinal	3+3

The sources of most health information in the World are in English. The Internet navigation to obtain information is basically in English. Some of the patients, attending clinics in Sudan, may only speak English language, especially with open-up of borders with economic development and of globalization. Passing the English language examination is an essential entry requirement to universities in Sudan. The general objectives of this course include: (1)correct pronunciation of medical terms, (2) correct reading and understanding of texts from medical books, (3) expressing one's self in good English describing his daily activities, career ambitions, present problems in health and current attempts at management, and (4) translating some pieces from English to Arabic, and others from Arabic to English, both from medical literature. Most of the content is detailed in the College Notes (NC- 113/05), the rest is achieved by self-directed learning and written assignments. The coordinators may decide to use other reference that fulfills the objectives.

Title	Code	Semester/Duration	Credits
BIOSTATISTICS MATH AND CALCULUS	STAT-117 RAD-CALC-120	1/Block 2 weeks 2/2 Weeks	2 3

A two-week module on basic statistics as applied to health, to include: (1) introduction to statistics, (2) probabilities, (3) data summary, (4) presentation; measurement of central tendency; interpretation of variation (dispersion), (5) population means, (6) normal distribution; confidence interval, (7) frequency distribution, (8) sampling techniques, (9) calculation and interpretation of the concept of confidence interval, (10) the concept of p-value and its interpretation, (11) the normal and skewed frequency distribution of biomedical data, and (12) how to apply the appropriate test of significance for a given data set and a given research methodology (using t test as an example).

Title	Code	Semester/Duration	Credits
COMPUTER SCIENCE-1&2	COMP-116-124	1/Block 2 weeks	2

This is a 2-week block that introduces the following facts: (1) textbooks of medicine and allied sciences are available on CDs, in which a large volume of knowledge is saved and easily retrievable, (2) there are many software packages demonstrating methods and techniques in clinical skills including patient rapport in history taking, clinical examination, investigations and

management, (3) students and teachers access the internet for the unlimited sources of information, both at their professional level and public level for health education, (4) students and future doctors are educators who have to prepare smart documents and presentations for the health team and profession at large, (4) knowledge of programmed like Word, Excel, and PowerPoint is indispensable for anyone learner or teacher, (5) computer is important for students both in the developed or developing world, more so for the latter, who might not have inherited voluminous libraries in their colleges and have to utilize the virtual libraries available all over the world, (6) medical journal as hard copies are difficult to be owned by one institution, now, most are available on-line for those who can use the computer efficiently.

The course is intensive focusing on the basic principles of (1) computer electronics and applications relevant to health science education, (2) hand-on experience in dealing with famous programmed like DOS, Word, Excel, PowerPoint, Access and Internet Explorer, (3) the use of CDs is extensively covered as well as having e-mails and navigating the internet for health information, (4) how to access medical journals, and communicate with scientists worldwide.

Title	Code	Semester/Duration	Credits
PHYSICS FOR MEDICAL EQUIPMENTS AND INVESTIGATIONS (MEDICAL PHYSICS)	PHYS-115	1/Block 3 weeks	3

The basic principles of general physics are important for understanding certain mechanisms that take part in the human body, and also, the technical background of many medical equipments. A medical professional is often confronted with a method of investigation or intervention that is based on physical or mechanical process in the human being and he/she has to deal cautiously with the machine and use it correctly considering its proper maintenance and patient's and worker's safety. These include physical chemistry, gas laws, physics of light and sound, and radiation. The details of the contents include; (1) physical quantities and units, (2) measurements techniques, (3) gases and gas laws, (4) waves, (5) optics, and (6) radiation.

Most of the content is detailed in the College Notes (NC- 115/05), the rest is achieved by self-directed learning and written assignments. The coordinators may decide to use other reference that fulfills the objectives.

Title	Code	Semester/Duration	Credits
- INTRODUCTION TO MEDICINE AND MEDICAL EDUCATION - BEHAVIORAL SCIENCE	ME-EDU-114 ME-BEHAV-129	1/Block 3 weeks 2/long	2 2

This is a three-week (2 CHs) block, starting with a simple medical problem that emphasize: (1) the meaning and message of health and health care delivery system in the country, (2) the role of the physician in, other professional and administrative staff in health care, (3) priority health problems, (4) concepts and principles of learning, (5) adult education and learning, (6) student centered learning, (7) problem-based learning, (8) instructional techniques (lecture, small group etc.), student assessment methods, (9) holistic approach, interdisciplinary and partnership con-

cepts, (10) curriculum development, (11) programme evaluation, (12) leadership and (13) professional ethics. Students are divided into groups to spend a week in a health facility, hospital theatre, hospital outpatient, health center, various directorates and departments of Federal and State Ministries of Health, etc.. Meanwhile students are given discussion sessions on group dynamics and instructional methods, at the end of the course the groups present their field activity using a suitable audiovisual technique. Evaluation assesses the knowledge and attitudes of the students in these three areas: health system, group dynamics and instructional methods.

Most of the content is detailed in the College Notes (NC- 114/05), the rest is achieved by self-directed learning and written assignments. The coordinators may decide to use other reference that fulfills the objectives.

Title	*Code*	*Semester/Duration*	*Credits*
BASIC BIOCHEMISTRY	BIOCH-118	1/Block 3 weeks	2

A three-week block in Semester 1, to include: (1) atomic structure, (2) chemical bonding, (3) chemical reactions,

(4) anabolism and catabolism, (5) molecular formulae, (6) solutions and solubility, (7) molarity and molality, (8) normality and molar fraction, (9) acids and bases, (10) buffers, (11) hydrocarbons, (12) isomerism, (13) introduction to organic compounds, (14) classification of aliphatic and aromatic hydrocarbons, their properties and reactions; (15) aldehydes and ketones, alcohols, phenols and ethers acids and amines, benzenes and their derivatives; (16) carbohydrates, (17) lipids, (18) proteins, (19) vitamins, (20) enzymes and coenzymes, (21) phospholipids, (22) cholesterols, (23) nucleic acids, (24) nitrogen bases.

Most of the content is detailed in the College Notes (NC- 118/05), and in the practical notes. The rest is achieved by self-directed learning and written assignments. The coordinators may decide to use other reference that fulfills the objectives.

Phase 2: Semesters 2-5, Organ System Courses

English language (ENG-123) -4 CHs longitudinal (See ENG-113)

Computer (COMP-124)- 2 CHs Block

Title	*Code*	*Semester/Duration*	*Credits*
RADIA TION PHYSIC	RAD-125	1/Block 3 weeks	3

This is a three-week-block detailing the physical aspects of all forms of ionizing and non-ionizing radiation, and start on the basics of radiation physics which include (!) structure of the atom (2) rations from the atoms (3) ionizing radiation (4)electromagnetic effect (5) x-rays and radio activity (6)nuclear characteristics (7) production of electromagnetic waves (8) interacting different types of radiations with matter and living cells (9)particular emphasis on diagnostic and therapeutic x-rays, nuclear medicine, ultrasound, CT and MRI. More detailed and specialized courses on the physics of each modality will follow.

Title	Code	Semester/Duration	Credits
HUMAN BODY STRUCTURE AND FUNCTION	PA-NAT-126	2/Block 4weeks	5

Upon the successful completion of this course the student will be able to describe and explain, at a basic level, the gross anatomy and introductory histology of the human body, especially the functional aspects of major tissues, organs, and systems including respiratory, cardiovascular, digestive, urinary, reproductive, endocrine and nervous with special emphasis on the interaction between these system and the major failures producing disease. More details are needed in neurobiology. There are some formal laboratory sessions. However a self-directed optional human anatomy laboratory is running all the time for independent study.

It also includes fundamentals of mammalian physiology in a systematic pattern: function of the nervous system (neurotransmitter, sensory and motor systems), endocrine gland and their secretions, bone and muscle physiology, cardiovascular, respiratory systems, gastrointestinal and renal physiology.

In addition it includes the characteristics, features and functions of neurons, ganglia, synapses, neuroeffector autonomic nervous system and somatic reflex arch. The concepts, definitions, processes and mechanism of membrane potentials, somatic and autonomic transmission, receptor activation and production of response. The structure, organization and regulation of adrenergic and cholinergic systems. Mechanisms (pathophysiology) of diseases related to cholinergic system (e.g. myasthenia gravis, peripheral neuropathy and diarrhea) and adrenergic system (e.g. hypotension, pheochromocytoma and asthma). Introduction to drugs affecting the autonomic system, their mechanism of action, metabolism, side effects, structure-activity relationships and clinical applications.

Title	Code	Semester/Duration	Credits
MAN AND HIS ENVIRONMENT (PHYS IOLOGY)	ME-MR-PHY-313	1/Block 5weeks	5

This is a 5-week-ccourse on the inter-relation between Man's internal and external environments, basic concepts of internal physiologic activities, body fluids, acid-base balance, biological membrane, body systems (respiratory, gastrointestinal, nervous etc..) exposed to environment, impact of environment on health, health consequences of exposure to potential environmental hazards (physical, chemical and biological), multi-disciplinary approach to environment, the role of the international organizations interested in environmental protection, principles of epidemiology, biological spectrum of environmental diseases, endemic and epidemic diseases.

Most of the content is detailed in the College Notes (NC- 126/06- Sections 1,2, and 3), the rest is achieved by self-directed learning and written assignments

Title	Code	Semester/Duration	Credits
IMAGING ANATOMY-1 & 2 (GROSS ANATOMY-REGIONAL)	RAD-ANAT-318 RAD-ANAT-212 RAD-ANAT-223	5/4 weeks 3/6 weeks 4/6 weeks	2 4 3

This is a six-week-block consisting of the following topics: (1) human skeleton, bones, joints, muscles and nerve supply and actions of the muscular system, (2) systemic anatomy of the cardiovascular, respiratory, gastrointestinal, abdominal wall, urinary, reproductive, endocrine and CNS, (3) emphasis on structures readily identifiable in images for image quality and orientation, or frequently investigated for disease, (4) identifying anatomic structure in routine and special radiographic images, ultrasound images, and in cross- transverse, sagittal and coronal images in CT and MRI.

Title	Code	Semester/Duration	Credits
MEDICAL TERM 1&2 PRINCIPLES OF DISEASE (PATHOLOGY)	RAD TERM 127&215 ME-DIS-212	1& 2/2 4/5 weeks	5 5

This is a five-week-block on general pathology and microbiology to include: (1)revision of general histology, (2) morphology, classification, staining reactions, and pathogenicity of bacteria, viruses and fungi, (3) sterilization and disinfection, (4) basic concepts in immunity, (5) principles of inheritance, introduction to molecular biology, and genetic defects underlying inherited disorders, (6) general pathology: inflammation: causes, tissue damage and repair, neoplasia and abnormal cell growth, (7) parasites and parasitic diseases, (8) anti-microbial and antiparasitic drugs.

Title	Code	Semester/Duration	Credits
DIAGNOSTIC IMAGING EQUIPMENTS-1 &2	RAD-213 and RAD-225	3/2 weeks 4/4 weeks	2 3

This is a two-week-block which introduces the student to the basic electrical and electronic principles required for diagnostic medical imaging equipment and machinery. It helps students to operate basic radiographic equipment effectively Define radiographic equipment. The student should: (1) describe types of electrical supplies, high tension cables and feeder, (2) define line voltage drop and describe distribution of electrical energy, (3) name types of X ray generators and describe voltage wave forms, falling load principle and constant potential generators, (4) differentiate between fixed anode and rotating anode types, (5) describe the filament circuit and control of the tube current, (6) define exposure time and describe exposure switching, (7) describe beam centering and devices used for beam centering, (8) mention how to control scatter radiation, (9) list fluoroscopic equipment and describe fluorescent screen and fluoroscopic table, (10) describe methods of image intensification, and (10) list equipment for rapid serial radiography, equipment for cranial and dental radiography and mammography equipment

The student should acquaint themselves with the ultrasound, CT, MRI and Gamma Camera, and the instruments in support of these modalities (details to follow in the clerkships).

Title	Code	Semester/Duration	Credits
INTRODUCTION TO RADIOGRAPHY 1&2	RAD-214-222	3/2weeks 4/2weeks	3 2

This is a four-week-block, which includes the historical development of radiography, an introduction to medical terminology pertinent to radiology, ethical and legal issues of health care professionals, and an orientation to the programme and the health care system in relation to medical imaging. Patient assessment, infection control procedures, emergency and safety procedures, communication and patient interaction skills, and basic pharmacology and basic radiation protection are also included. The student has to (1) describe theoretical basis of radiography, (2) outline radionuclide imaging techniques, (3) describe principles of radiophotography, (4) describe and apply image recording techniques currently employed in diagnostic radiology and nuclear medicine, (5) define X ray tube and describe how X ray is generated, (6) define geometry of thickness, wavelength of beam and composition of object transmission, (7) list and operate radiological equipment common encountered in radiology units, (8) describe radiographic processing area.

Title	Code	Semester/Duration	Credits
ULTRASOUND PHYSICS	RAD-SONO-217	5/2weeks	2

This is a two-week-block that course covers general physical principle of the various types ultrasound devices in medicine and for imaging. It also enables students perform examination of the different organs and systems of the body by ultrasound technology. The student should: (1) mention principles of sound wave generation, reflection and absorption, (2) name physical and biological effects and hazards of ultrasound waves, (3) describe various types of waves, (4) define Doppler colour and describe its effects, (5) describe the process of generation of ultrasound signals, (6) name various types of ultrasound wave generating equipment and describe operational principles of each, (7) name the various types of ultrasound examinations and read and outline routine of interpreting results, (8) utilize ultrasound machines for obstetrical and gynecological diagnostic procedures, (9) outline use ultrasound equipment for diagnostic procedures pertinent to the liver, biliary system, GIT and urinary system, (10) outline use ultrasound technique for biopsy sampling for visceral and endocrine organs, (11) describe how colour Doppler flow technique is performed, and (12) list limitations of US techniques and name alternative diagnostic techniques.

Title	Code	Semester/Duration	Credits
PROFESSIONAL CLINICAL SKILLS	ME-SKIL-221+311	4,5 &6/ Longitudinal	2 each semester

This is a two-hour weekly session during semester 3, to include: (1) communication skills of speaking, hearing, listening, recognizing strengths and weaknesses of close-ended and open-ended questions, non-verbal communications, establishing rapport, interview and be

interviewed, dealing with a difficult patient, (3) give intravenous and intramuscular injection, fix a fluid line, take venous blood and recognize normal blood cells, basic blood tests,(4) recognize shock and manage emergencies at the radiology department, (5) observe vital signs (6) observe intervention- radiological techniques, (7) abdominal ultrasound, observe all routine ultrasound examinations ,biopsy guided u/s and FNA (8) recognize the procedures in CT and MR , and show ability to operate, and observe CT guided biopsy(9) interpret emergency images. (10) interpret a normal ECG and that of myocardial infarction, (11) basic life support skills. (12) observe interventional procedures (13) attend catheter lab and angiography investigations

Title	Code	Semester/Duration	Credits
PHYSICS FOR COMPUTED TOMOGRAPHY	RAD-222	4/2 weeks	3

This is a two-week- block that describe the physical principles of CT images. The student should: (1) describe the methods of attenuation measurement, (2) describe the single detector rotation-translation (first generation) scanners, the multidetector (2^{nd} generation) scanners, rotation scanners with movable detectors (third generation), rotation system with stationary detectors (4^{th} generation), (3) define the volume element, (4) define the density value, (5) describe the partial volume effect and types of artifacts (6) know the principles of spiral and helical CT scanners and single slice and multi-slice spiral scanners

Title	Code	Semester/Duration	Credits
RADIOGRAPHIC TECHNIQUES AND PROCEDURES 1&2	RAD-TECH-216 RAD-TECH-224	4/6 weeks	6

This is a six-week-block that includes an introduction to radiographic positioning terminology, the proper manipulation of equipment, positioning and alignment of the anatomical structure and equipment, and evaluation of X ray images for proper demonstration of basic anatomy and related pathology. The student should: (1) outline parts of the human body subject radiographic imaging in X-ray units, (2) list steps of basic positions of skull radiography, (3) mention steps special positions of skull radiography, (4) list steps of radiography of the mandible and facial bones, (5) list steps of radiography of the shoulder upper limb, wrist and hand, (6) list steps of radiography of the hip, lower limb and knee, (7) list steps of radiography of the foot, (8) list steps of radiography of the chest, ribs and sternum, (9) list steps of radiography of the pelvis, (10) list steps of radiography of various parts of the vertebral column, (11) show skill in preparation of X-ray films for the loco-motor system, chest, skull and facial bones, and (12) write reports on techniques done or attended and compile them into booklets.

Title	Code	Semester/Duration	Credits
INTRODUCTION TO MEDICAL ETHICS	RAD-226	1/2weeks	2

The student should show an understanding of the (1) history of medicine; before and during the Islamic era, (2) the role of the Moslem scholars in the practice of medicine, research and medical ethics, (3) the milestones of medical education in the Islamic era, (4) the Fight of illness and the sick, the religious regulations concerning treating the sick person, how does the

sick person performs his rituals: cleanliness, prayers, fasting, pilgrimage? Also, (5) the visiting of sick person, (6) managing a death episode, (7) the religious conduct when males are managing female disease and vice versa, (8) the emerging controversialities of vitro fertilization, transplantation, brain death, cloning, genetic engineering. Students should be aware of the (9) Fight of health preservation including cleanliness, sleep, moderation in eating and drinking, the jurisprudence of toxic substances and narcotics, infectious diseases, breast feeding, consanguity marriage, quarantine, death and funerals, dissection of human body for teaching and law, (10) medical behaviour, professional ethics, responsibility of a health professional, (11) issues in protection of acts of a health professional and (12) giving an expert witness at court.

Title	Code	Semester/Duration	Credits
RESEARCH METHODOLOGY AND SCIENTIFIC WRITING	ME-RES-227	7/2weeks	2

This is a two-week- block, which focuses on the synthesis of professional knowledge, skills, and attitudes in preparation for professional employment and lifelong learning. Students are trained to perform small research projects in one of the radiology topics that enable them to collect data, review literature, obtain results and discuss their findings in the form of presentations. The student should: (1) describe research methodology listing elements of research, (2) collect up to date information on a particular topic, using proper sampling techniques (3) execute a small research project and analyze obtained data, (4) discuss the significance of the results obtained and research conclusions, and (5) write down a research paper, and (6) present his findings in front of the class and discusses it with his colleagues and staff.

Title	Code	Semester/Duration	Credits
RADIOGRAPHIC PATHOLOGY	RAD-312	5/4weeks	4

This is a four-week- block that covers pathologic lesions and terminology pertinent to traditional radiology, CT, ultrasound and MRI. It describes characteristics of pathological lesions as seen by various radiographic imaging procedures and relates their features with diagnosis. The course also aims at strengthening relations between radiology technologic specialists and physicians. The student should outline the pathological features affecting the GIT, Liver & biliary system bones respiratory, cardiovascular, genitor-urinary and nervous systems.

Title	Code	Semester/Duration	Credits
PATIENT CARE AND ETHICS	RAD-313	3/2weeks	2

This is a two-week-block that provides students with basic concept patient care, including considerations for psychological and physical needs of the patient and family. Routine and emergency patient care procedures should be described to the patient. The course also covers the role radiographer in patient education. The student should: (1) employ interpersonal skills to alleviate patient fears, (2) discuss responsibilities of the radiographer towards the patient, (3) discuss the scope of practice of the radiographer, (4) discuss personal, emotional and ethical aspects of death, (5) describe support mechanisms available to the terminally ill, (6) mention

methods of determining the proper patient identification, (7) interact with patient family members and friends, (8) demonstrate methods assessment of the vital signs, (9) explain use of auxiliary equipment, immobilization devices and communication systems, (10) alleviate patient fears by explaining length, positioning and other aspects of the procedure, and (11) employ general safety precautions and describe specific patient safety measures and concerns

Title	Code	Semester/Duration	Credits
COMPUTER IN MEDICAL IMAGING	RAD-COMP-314	4/2weeks	3

This is a two-week- block that provides information necessary for understanding of the basic concepts of computer systems and microprocessors and the utilization and application of computer in medical imaging, radiation dose calculation and distribution, record keeping, appointment systems, and building stock-keeping. The student should: (1) outline use of computer hardware and software in medical imaging, (2) apply computer technology for patient data management system Utilize quality assurance data representation, (3) utilize computer for acquisition of data in CT, nuclear medicine radiotherapy, digital radio-imaging, and other forms of radiobiological apparatus, and (4) utilize quality assurance data representation

Title	Code	Semester/Duration	Credits
RADIONUCLIDE IMAGING(NUCLEAR MEDCINE PHYSICS&TECHNIQUES)	RAD-NUCPHY-229	4/2weeks	3

This is a two-week-block reviewing the natural radioactivity and the radionuclide used in the medical profession. The student should: (1) name the radioactive material used in imaging, the methods of preparation, precautions and indications, (2) describe the scintillation camera, SPECT, PET, (3) list the uses of Gallium scintigraphy, indications of bone and brain scintigraphy, (4) describe the indications and findings of scintigraphy of the thyroid, lung, heart, liver and GIT and kidneys.

Title	Code	Semester/Duration	Credits
CROSS-SECTIONAL ANATOMY	RAD-ANAT-316	5/3weeks	2

This is a three-week- block. This course provides adequate information on the anatomy of the various parts of the human body at various levels of cross, coronal and sagittal sections, and relates such information to tomography. The course content includes essentials information necessary for students to understand the anatomy of the body that particularly relates to diagnostic imaging, nuclear medicine and ultrasonography. Students are trained to depict locations of the various internal organs on the basis of surface anatomy and appearance in diagnostic images. Students are taught to identify various pathological changes identifiable by tomography.

Title	Code	Semester/Duration	Credits
BASIC AND RADIO-PHARMACOLOGY	RAD-PHARM-319	5/3weeks	3

This is a three-week- block that discusses drugs and medicaments commonly prescribed for patients of X ray units and address indications, contraindications, side effects, and their pharma-

codynamics and pharmacokinetics. The course also addresses radiochemistry and its utilization in nuclear medicine. The student should: (1) evaluate patient's illness and recognize drugs and therapies used and define significance of radiological procedures, (2) suggest appropriate plan needed for the imaging procedure required for each patient, (3) provide adequate drugs and medicament needed and register them in an appropriate way, (4) evaluate patients conditions, before, during and after the imaging procedure, (5) list rules and regulations governing drug policies in relation to radiological procedures, (6) describe thermal neutron reactors, cyclotron and fission and equilibrium within the generator system, (7) calculate conversion of units used in radio-pharmacy, (8) describe the labeling process in radiopharmaceutical preparations and identify proper methodologies in kit preparation, and (9) calculate the correct concentration, activity and dose using the decay formula

Title	Code	Semester/Duration	Credits
RURAL HOSPITAL RESIDENCY	RAD-SUM-331	6/2weeks	2

This is a two-week- block in the Summer following Semester 6, to be spent in a rural hospital as near as possible to the student's residence. A log book containing the basic radiological skills should be signed by the supervisor in the rural hospital. A confidential report should be filed mentioning the ethical and social commitment of the student during his residency.

Title	Code	Semester/Duration	Credits
ADVANCED TECHNIQUES AND PROCEDURES 1&2&3	RAD-ADTEC-317 RAD-ADTEC-411	5/6 weeks 6/5 weeks	2 2

This is a six-week-block that includes an introduction to radiographic advanced procedures and special investigation ,ivu, Ba studies of swallow meal enema, and sailogram, angiography and catheter lab and interventional procedures and CT guided and U/S biopsy and FNA ,positioning terminology, the proper manipulation of equipment, positioning and alignment of the anatomical structure and equipment, and evaluation of X ray images for proper demonstration basic anatomy and related pathology. The student should: (1) outline parts of the human body subject radiographic imaging in X-ray units, ((2) show skill in preparation of X-ray film and patient and tray and contrast media for special investigations (3) write reports on techniques done or attended and compile them into booklets.

Title	Code	Semester/Duration	Credits
RADIOBIOLOGY AND PROTECTION	RAD-SUM—412 RAD –PR-28	3/2weeks 7/3weeks	3 2

This is a two-week- block, which addresses biological hazards of radiology in various aspects of medicine and biology focusing methods of protection of radiology staff and patients from radiation hazards, influence of radiation in the laboratory and hospital environment. It also covers procedures to be followed in cases of radiological exposure emergencies and accidents. The

student should: (1) define various radiological terms (radiological safety organization, maximum permissible dose MPD, shielding, monitoring, and radiation record), (2) mention hazards of radiation and general actions of ionization, (3) depict accidents that could occur in radiological units and other medical or research facilities that utilize radiation, (4) describe biologic damage, (5) explain how radiation dangers are avoided and name methods adopted to minimize such effects, (6) take appropriate action in cases of radiation, (7) describe effects of radiation on matter, (8) explain adverse effects of radiation on living organisms, (9) mention regulations and rules governing restricted areas, (10) mention the significance of continuous scanning and surveillance for such areas, (11) name necessary investigations needed for persons overexposed to ionized radiation, (12) explain safeguards against hazards and future safe utilization radiation in nuclear medicine, (13) explain safe handling of radioisotopes and appropriate methods used for handling waste, (14)mention safeguards against electrical accidents, and (15) list safety measures adopted for radiology.

Title	Code	Semester/Duration	Credits
RADIOTHERAPY	RAD-THER-413	7/4 weeks	2

This is a four-week-clerkship that enables students to acquire the necessary skills in clinical situations that qualify them to participate in basic treatment techniques of radiotherapy and nuclear medicine. The course covers the physical basis of nuclear medicine. It helps students to operate equipment needed for nuclear medicine and understand physical basis of machine operation. It also addresses precautions and patient and staff safety measures to be taken in nuclear medicine. The student should: (1) define radiotherapy and nuclear medicine, (2)describe positioning for major radiotherapy and radio-nuclear procedures, (3) operate the different types of radio-nuclear equipment, outline their mechanism of operation, and take safety measures needed for operation of each equipment, (4) describe various types of radioisotope generators, (5) describe principle of isotope production, (6) describe stages of radioactive isotope disintegration, (7) outline the process of radioimmunoassay and describe the mode of action of radiopharmaceuticals, (8) perform image and data capturing, display and discuss the theoretical basis of such operations and their utilization in nuclear medicine, (9) define the computerized gamma camera system and list its properties, (10) project images on monitors, (11) attend operation and discuss mechanism of action of the various components of nuclear medicine computers, (12) define gamma camera interface, (13) compare analog differentiation to digital differentiation, and (14) discuss principles of image projection, colour and depth of picture.

Title	Code	Semester/Duration	Credits
ABDOMEN AND ALIMENTARY TRACT IMAGING	RAD-322	6,7 or 8/8weeks	6

This is a eight-week-clerkship that enables students to acquire the necessary skills needed in clinical the situation and qualifies them to participate in undertaking basic and special procedures for the abdomen and gastrointestinal tract (GIT) with or without contrast media, fluoroscopy. The course covers anatomy, pathology and physiology of GIT, examination of the esoph-

agus, stomach, intestines, liver, gall bladder, bile ducts, pancreas and spleen, as well as nuclear medicine procedures for GIT and the hepatobiliary system, and applications of various imaging modalities specific for the system. The student should: (1) Describe anatomy and physiology of the GIT and hepatobiliary system, (2) list major pathological lesions of GIT and hepatobiliary system, (3) evaluate condition of a GIT and hepatobiliary system patient and mention precautions to be taken before the procedures, (4) prepare the patient for the procedure, execute the procedure and describe patient management after the procedure, (5) list indications, contraindications and complications of each procedures and mention methods of dealing with each complication, (6) name contrast media and radiochemical needed specifically needed for imaging modalities applicable to the system and mention the mechanism of their action, complication; and methods of avoiding or alleviating those complications, (7) perform plain abdomen radiographs, contrast GIT examination with fluoroscopic control, (8) list advantages and disadvantages of the single contrast examination by barium sulphate, (9) perform double contrast examination of the stomach and colon, (10) perform ultrasound and MRI/CT for GIT, liver and the spleen, (11) describe endoscopic retrograde cholangiopancreatography, oral cholecystography and percutaneous transhepatic cholangiography, (12) describe preparations for imaging during gastroscopy, sigmoidoscopy, colonscopy and barium en ema, and (13) write reports on technological aspects of imaging procedures.

Title	*Code*	*Semester/Duration*	*Credits*
CHEST AND RESPIRATORY SYSTEM IMAGING	RAD-323	6,7 or 8/6weeks	6

This is a six-week-clerkship that enables students to acquire the necessary skills needed in clinical the situation and qualifies them to participate in undertaking basic and special procedures for the chest and respiratory system with or without contrast media, fluoroscopy. The course covers anatomy, pathology and physiology of respiratory system, examination of the larynx, trachea, lung, pleura and chest wall. It also addresses nuclear medicine procedures for chest and respiratory system, and applications of various imaging modalities specific for both. The student should: (1) describe anatomy and physiology of the respiratory system, (2) list major pathological lesions of respiratory system seen in chest images, (3) evaluate condition of a respiratory system patient and mention precautions to be taken before the procedures, (4) prepare the patient for the procedure, execute the procedure and describe patient management after the procedure, (5) list indications, contraindications and complications of each procedures and mention methods of dealing with each complication, (6) name contrast media and radiochemical needed specifically needed for imaging modalities applicable to the system and mention the mechanism of their action, complication; and methods of avoiding or alleviating those complications, (7) perform plain chest radiographs, contrast respiratory examination with fluoroscopic control, (8) mention disadvantages of chest fluoroscopy as compared to chest CT, (9) perform ultrasound and MRI/CT for chest and respiratory system, (10) describe the technical preparation and procedures for bronchography, radionuclide lung scanning, pulmonary angiography, and (11) write reports on the procedures on this system.

Title	Code	Semester/Duration	Credits
CARDIOVASCULAR SYSTEM IMAGING	RAD-324	6,7 or 8/4 weeks	6

This is a four-week-clerkship that enables students to acquire the necessary skills needed in clinical the situation and qualifies them to participate in undertaking basic and special projections for the cardiovascular system with or without contrast media, fluoroscopy. The course covers anatomy and physiology of CVS, examination of the heart, cardiac angiography, cardiac catheterization, nuclear medicine cardiac studies and applications of ultrasound. It also covers various types of radiographic procedures for angiography. The student should: (1) describe anatomy of the cardiovascular system (CVS), (2) list major pathological lesions of CVS, (3) evaluate condition of a CVS patient and mention precautions to be taken before the procedures, (4) prepare the patient for the procedure, execute the procedure and describe patient management after the procedure, (5) list indications, contraindications and complications of each procedures and mention methods of dealing with each complication, (6) name contrast media and radiochemical needed specifically needed for imaging modalities applicable to the system and mention the mechanism of their action, complication; and methods of avoiding or alleviating those complications, (7) perform or describe methods of preparations or performing various types of cardiography, arteriography and venography, and (8) write reports on the procedures in this system.

Title	Code	Semester/Duration	Credits
ULTRASOUND IMAGING	RAD-SON-325	6,7 or 8/3weeks	3

This is a three-week-clerkship spent in a clinic or clinics providing the service. Observing and performing different U/S investigations abdomen ,pelvis, obse. and gyn A logbook containing the skills to be learned in the unit should be signed by the trainer in charge. A confidential report should be filed mentioning the behavioural or ethical and social commitments of the student during this clerkship.

Title	Code	Semester/Duration	Credits
CT IMAGING	RAD-CT-TEC-326	6,7 or 8/2weeks	2

This is a tow-week-clerkship spent in a clinic or clinics providing the service. Observing and performing CT Investigations and protocols brain, abdomen , chest pelvis . A logbook containing the skills to be learned in the unit should be signed by the trainer in charge. A confidential report should be filed mentioning the behavioural or ethical and social commitments of the student during this clerkship.

Title	Code	Semester/Duration	Credits
MR IMAGING	RAD-MRI-327	6,7, or 8/3weeks	2

This is a three-week-clerkship spent in a clinic or clinics providing the service ,Observing and performing MRI procedures ,brain, chest, abdomen and pelvis. A logbook containing the skills to be

learned in the unit should be signed by the trainer in charge. A confidential report should be filed mentioning the behavioural or ethical and social commitments of the student during this clerkship.

Title	Code	Semester/Duration	Credits
IMAGING UNIT MANAGEMENT QUALITY ASSURANCE	RAD-MA-G-329 RAD-QA-328	6,7 or 8/2weeks 5/2 weeks	2 2

This is a two-week-clerkship that covers the principles of management and safety of radiology and nuclear medicine units and laboratories. This course also covers quality control, including various types of quality assurance tests, quality control testing equipment and assessment of performance of various radiological equipments. The student should: (1) abide radiation protection legislations and regulations, (2) show administrative skills of running radiology and nuclear medicine units, (3) show competence in dealing with his / her staff and superiors, (4) keep records of patients, images, therapeutics, media and other supplies, (5) show ability of improving the work environment, (6) apply quality control measures in all units and laboratories of nuclear medicine and radiology labs, (7) list quality control procedures and methods in radiology laboratories, (8) assess performance of general radiographic equipment and analyze image quality, (9) perform quality control measures for conventional tomography, (10) describe quality control measures for mobile and mammographic equipment, (11) analyze film faults and artifacts, (12) assess CT system performance and image quality, and (13) assess performance of ultrasound and NM equipment.

Title	Code	Semester/Duration	Credits
GENITO-URINARY IMAGING FILM REVIEW & INTERPRETATION	RAD-CLIN-414 RAD-REV-424	6,7 or 8/4weeks 8/4 weeks	6 4

This is a four-week-clerkship that enables students to acquire the necessary skills needed in clinical the situation and qualifies them to participate in undertaking basic and special projections for the genitor-urinary system (GUS) with or without contrast media, fluoroscopy. The course covers anatomy and physiology of GUS, examination of the kidneys, urinary bladder, ureters, and urethra as well as urinary catheterization, nuclear medicine procedures for GUS and applications of various imaging modalities specific for the system. The student should: (1) describe anatomy and physiology of the GUS, (2) list major pathological lesions of GUS, (2) evaluate condition of a male or female GUS patient and mention precautions to be taken before the procedures, (3) prepare the patient for the procedure, execute the procedure and describe patient management after the procedure, (4) list indications, contraindications and complications of each procedures and mention methods of dealing with each complication, (5) name contrast media and radiochemical needed specifically needed for imaging modalities applicable to the system and mention the mechanism of their action, complication; and methods of avoiding or alleviating those complications, (6) perform various types of intravenous urograms (IVU), retrograde and antegrade pyelography, urethrography and renal angiography, (7) define hysteroslpingography and perform ultrasound, CT and MRI for the ovaries and female reproductive tract, (8) mention precautions taken during pregnancy imaging and fetal monitoring,

(9) perform pelvimetry, and (10) write reports on procedures in this system.

Title	Code	Semester/Duration	Credits
MUSCULOSKELETAL IMAGING	RAD-322	6,7 or 8/6weeks	6

This is a six-week-clerkship that enables students to acquire the necessary skills needed in clinical the situation and qualifies them to participate in undertaking basic and special projections for the musculoskeletal system (MSS) with or without contrast media, fluoroscopy. The course covers anatomy and physiology of MSS, examination of the upper and lower limb bone, spine, skull, and joints as well as sinuses and orbits, nuclear medicine procedures for MSS and applications of various imaging modalities specific for the system. The student should: (1) describe anatomy and physiology of the MSS, (2) list major pathological lesions of MSS, (3) evaluate condition of a MSS patient and mention precautions to be taken before the procedures, (4) prepare the patient for the procedure, execute the procedure and describe patient management after the procedure, (5) list indications, contraindications and complications of each procedures and mention methods of dealing with each complication, (6) name contrast media and radiochemical needed specifically needed for imaging modalities applicable to the system and mention the mechanism of their action, complication; and methods of avoiding or alleviating those complications, (7) perform plain bone radiographs, radio-nuclear bone scans, computed tomography for bone disease, MRI for MSS, and positioning and techniques used for bone trauma, and (8) write reports on the procedures in this system.

Title	Code	Semester/Duration	Credits
CNS AND ENDOCRINE IMAGING	RAD-323	6,7 or 8/4weeks	6

This is a four-week-clerkship that enables students to acquire the necessary skills needed in clinical the situation and qualifies them to participate in undertaking basic and special procedures for the central nervous system (CNS) and endocrine system with or without contrast media, fluoroscopy. The course covers anatomy and physiology of CNS and major endocrine glands, examination of the CNS, spine, skull, pituitary gland, thyroid gland, and pineal body. It also addresses nuclear medicine procedures for CNS and endocrine glands, and applications of various imaging modalities specific for both systems. The student should: (1) describe anatomy and physiology of the CNS, pituitary, thyroid and pineal body, (2) list major pathological lesions of the brain, spinal cord and major endocrine glands, (3) evaluate condition of a CNS patient and mention precautions to be taken before the procedures, (4) prepare the patient for the procedure, execute the procedure and describe patient management after the procedure, (5) list indications, contraindications and complications of each procedures and mention methods of dealing with each complication, (6) name contrast media and radiochemical needed specifically needed for imaging modalities applicable to the system and mention the mechanism of their action, complication; and methods of avoiding or alleviating those complications, (7) list disadvantages of radionuclide imaging, (8) produce plain skull and pituitary

fossa films, (9) define neurosonography and describe computed tomography procedures for head injuries, (10) perform or state the theoretical background radio-nuclear skull and spine scans, computed tomography for the skull, brain and spine and MRI for CNS, pituitary gland, pineal gland and thyroid gland, and (11) write reports on the procedures in these system.

Title	Code	Semester/Duration	Credits
GRADUATION PROJECT	RAD-GRAD-421-422	During Semester 8/2weeks	6

This course prepares the student to conduct research as graduation project which includes research problem, objectives, and data analysis and result presentation. By the end of the project the student should be able to: (1) Introduction to research methodology and identification of research problems,(2)Learn how to collect and classify of data,(3) Formulate research objectives,(4) Design studies and research,(5) Learn how to choose .sample size calculation,(6) Discuss process and analyze data

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