

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB

Syllabus for 3 Years B. Sc. (Hons) in Telemedicine and Digital Health

(Effective for Students Admitted in Academic Session 2021-2022)

Semester IV

Subject Type		Course Code	Subject	Contact Hrs./Week			Credit	Mode of Delivery	Proposed MOOCs
				L	T	P			
CC	CC8	DHT401	Digitalization of Health care delivery Systems	5	1		6	Offline/Blended	As per MAKAUT Notification
	CC9	DHT402	Image Processing and Transmission	4			6	Offline/Blended	
		DHT492	Image Processing and Transmission(P)			2		Offline/Blended	
CC10	DHT403	Health Information Management and Health Informatics	5	1		6	Offline/Blended		
GE	GE4		GE BASKET 1/2/3/4/5	4			4	Offline/Online	
						2	2	Offline/Online	
SEC	SEC2	DHT405	Clinical Applications of Biomedical Signal Processing	1		1	2	Offline/Online	
Semester Total Credits							26		

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DETAILED CONTENTS FOURTH SEMESTER

Core Courses

Digitalization of Healthcare Delivery Systems (DHT 401)

Full marks: 100

Credit: 6

Lecture period: 60 hrs

Course Objectives: This course is designed to acquaint students with concept of digitalization of healthcare systems

COURSE OUTCOMES:

On Completion of the Course, Students will be able to:

CO1: Explain the building blocks of a health system

CO2: Describe the components of a health system (inputs, processes, outputs, outcomes and impact)

CO3: Identify the scope of digitalization of healthcare

CO4: Enumerate the different classes of digital health interventions

Contents: (4 Modules, each for 15 hours)

UNIT 1: Introduction to Health Systems

Definition, System Building Blocks, Overall Goals / Outcomes.

UNIT 2: Components of Health Systems

Inputs and Processes, Outputs, Outcomes, Impact.

UNIT 3: Major Health System Challenges

Insufficient supply of commodities, Lack of Access to Information or Data, Loss to follow up of Clients, Framework for Digitalization of Healthcare.

UNIT 4: Categories of Digital Health Interventions

Class 1.0: Clients

Class 2.0: Healthcare Providers

Class 3.0: Health system Managers

Class 4.0: Data Services

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Textbooks:

1. Macmillan P, The Digitization of Healthcare: New Challenges and Opportunities, Springer, 2017
2. Glauner P, Plugmann P, Lerzynski G, Eds, Digitalization in Healthcare: Implementing Innovation and Artificial Intelligence, Springer 2021

References:

1. World Health Organization. (2018). Classification of digital health interventions v1.0: a shared language to describe the uses of digital technology for health. World Health Organization. <https://apps.who.int/iris/handle/10665/260480>. License: CC BY-NC-SA 3.0 IGO

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Image Processing and Transmission (DHT402)

Full marks: 100

Credit: 4

Lecture period: 40 hrs

COURSE OUTCOMES:

On completion of the course students will be able to:

CO-1 Explain the process of image acquisition storage, processing, communication & display.

CO-2 Explain the formation of image model & basics enhancements techniques.

CO-3 Explain the image segmentation processing in detail.

CO-4 Explain the basic applications of image processing in medical systems and Telemedicine

COURSE CONTENT:

Unit-I DIGITAL IMAGE PROCESSING SYSTEM: Image acquisition storage, processing, communication display. Visual perception: Structure of Human Eye, Image formation in human eye, brightness and contrast, adaptation and discrimination, Block's Law and critical fusion frequency photographic film characteristics.

Unit-II IMAGE MODEL: Uniform and non-uniform sampling, quantization, Image enhancement: Image smoothing, point operators, contrast manipulation, histogram modification, noise clipping image sharpening, spatial operators, frequency domain method, low pass and high pass filtering, homomorphic filtering, median filtering.

Unit-III Medical Image Segmentation: Histogram-based methods, Region growing and watersheds, Markov Random Field models, active contours, model-based segmentation. Multi-scale segmentation, semi-automated methods, clustering-based methods, classification-based methods, atlas-guided approaches, multi-model segmentation.

Unit-IV Biomedical application: Computer Tomography, Emission Tomography, CAT, Radon Transform CAT, MRI Images. Processing of Radiograph, Angiogram, Sonography including Doppler, Projection Theorem, Back Projection.

TEXT BOOK:

1. Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", 2nd ed, Addison - Wesley Publishing Company, New Delhi, 2002.
2. William R Hendee, E. Russell Ritenour, "Medical Imaging Physics", 4th ed., John Wiley & Sons, Inc., New York, 2002.

REFERENCE BOOKS:

1. Paul Suetens, "Fundamentals of Medical Imaging", 2nd ed., Cambridge University press, 2009.
2. J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Vol. 2, SPIE Press, 2000

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Image Processing and Transmission (P) (DHT 492)

Full marks: 100

Credit: 2

Lecture period: 40 hrs

COURSE OUTCOMES:

On completion students will be able to

CO1: Identify different medical imaging techniques

CO2: use software tools for analysis of medical images

CO3: export the analysed or modified image for assistance to qualified medical practitioners.

List of Experiments:

Expt 1: To do basic Image import, Processing and Export using software

Expt 2: To Detect and Measure objects in an image using software

Expt 3: Correct nonuniform illumination and analyse foreground objects using software

Expt 4: ECG signal analysis using Matlab or any other software

Expt 5: CT scan analysis using Matlab or any other software

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Health Information Management (HIM) and Health Informatics (HI) (DHT 403)

Full marks: 100

Credit: 6

Lecture period: 60 hrs

Course Objectives: This course is designed to acquaint students with concept of managing health information and applying principles of health informatics to generate new knowledge of healthcare

COURSE OUTCOMES:

On Completion of the Course, Students will be able to:

CO1: Explain the basics and components of health information management and health informatics

CO2: Describe the components of health information cycle

CO3: Identify the scope of health informatics for improving health outcomes

CO4: Enumerate the different roles health informatics professionals

Contents: (4 Modules, each for 15 hours)

UNIT 1: Introduction

Health Information Management, Health Information Technology and Health Informatics, digital health interventions, How does a hospital information system integrate these efforts.

UNIT 2: Basics

Health Data Literacy, Digital Health Literacy, Health Information Management System (HIMS) or Health Management Information System (HMIS), Health / Hospital Information System (HIS): Architecture, Organization, Structure, Information Collection and Processing, and, Applications.

UNIT 3: Management

Management of data and information as needed by stakeholders, Role of health information exchange and management, How to address the needs of the various stakeholders.

UNIT 4: Regulatory

Regulatory aspects and IT security (Privacy, confidentiality and security for HIS), Ayushman Bharat Digital Mission (ABDM), Digital Personal Data Protection Bill 2022.

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Suggested Reading:

1. Weaver, C.A., Ball, M.J., Kim, G.R., Kiel, J.M. (Eds.), Healthcare Information Management Systems: Cases, Strategies, and Solutions, 4th ed, Springer, 2016
2. Balaraman P and Kosalram K, E – Hospital Management & Hospital Information Systems – Changing Trends *I.J. Information Engineering and Electronic Business*, 2013, 1, 50-58: <http://www.mecs-press.org/ijieeb/ijieeb-v5-n1/IJIEEB-V5-N1-6.pdf>
3. **Sarbadhikari SN** and Srinivas M, Health Informatics and Health Information Management, In, Gyani G and Thomas A, Eds, Handbook of Healthcare Quality and Patient Safety, Jaypee, New Delhi, 3rd ed, 2022, Sec. 4 (Clinical Governance), Ch. 20: 274-286.
4. Gazette of India, The National Commission for Allied and Healthcare Professions Act, 2021 , Available from: <https://egazette.nic.in/WriteReadData/2021/226213.pdf>
5. **Sarbadhikari SN**, Pradhan KB, The Need for Developing Technology-Enabled, Safe, and Ethical Workforce for Healthcare Delivery, *Safety and Health at Work*, 2020, **11**(4): 533-536. <https://doi.org/10.1016/j.shaw.2020.08.003> Available from: <http://www.sciencedirect.com/science/article/pii/S2093791120303164>
6. Ministry of Health and Family Welfare, Government of India, national Digital Health Blueprint, 2019, Available from: <https://main.mohfw.gov.in/newshighlights/final-report-national-digital-health-blueprint-ndhb>
7. Weber P, Vimarlund V, Ognjanovich I, John O, Wu Y, Ji M, Kavitha B and **Sarbadhikari SN**, “*Social determinants of health: Trends and issues in three developing countries*” in Delaney CW, Weaver CA, Sensmeier J, Pruinelli L and Weber P, Eds, Nursing and Informatics for the 21st Century: Embracing a Digital World, 3rd Edition – Book 4: Nursing in an Integrated Digital World that Supports People, System and the Planet. ISBN: 9781032249827. Routledge, Taylor & Francis Group, 605 3rd Avenue, 22nd Floor, New York, NY 10158. 2021.

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Clinical Applications of Biomedical Signal Processing (DHT 405)

Full marks: 100

Credit: 2

Online Lecture + Practical period: 40 hrs

Course Objectives: This course is designed to acquaint students with concept of clinical applications of biomedical signal processing

COURSE OUTCOMES:

On Completion of the Course, Students will be able to:

CO1: Identify abnormalities from the images

CO2: Identify the disease and disorders from the images

DETAILED SYLLABUS:

UNIT I	CHEST IMAGING
UNIT II	CENTRAL NERVOUS SYSTEM IMAGING
UNIT III	VASCULAR IMAGING
UNIT IV	MUSCULOSKELETAL IMAGING
UNIT V	TRAUMA IMAGING
UNIT VI	GASTROINTESTINAL SYSTEM IMAGING
UNIT VII	GENITOURINARY SYSTEM IMAGING
UNIT VIII	HEPATOBILIARY SYSTEM IMAGING
UNIT IX	HEAD & NECK IMAGING
UNIT X	PAEDIATRIC IMAGING
UNIT XI	BREAST IMAGING
UNIT XII	FOREIGN BODIES IMAGING

(Further detailing can be done if required)

TEXT BOOK: Ahuja A. T. "Case Studies in Medical Imaging Radiology for Students and Trainees", Cambridge University Press, 2006

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REFERENCE BOOKS:

1. Veena Chowdhury, Arun Kumar Gupta, Niranjana Khandelwal - Diagnostic Radiology_ Musculoskeletal and Breast Imaging-Jaypee Brothers Medical Publishers (2012)
2. (Medical Radiology _ Diagnostic Imaging) Rüdiger von Kummer, Tobias Back, K. Sartor - Book MRI in Ischemic Stroke-Springer (2005)
3. (Aiims-mamc-pgi Imaging Series) A. K. Gupta - Diagnostic Radiology_ Gastrointestinal and Hepatobiliary Imaging-Jaypee Brothers Medical Publishers (2008)
4. (AIIMS-MAMC-PGI imaging course series) Veena Chowdhury_ (Physician) Arun Kumar Gupta_ Niranjana Khandelwal - Diagnostic radiology. Paediatric imaging-Jaypee Brothers Medical Publishers
5. (Aiims-mamc-pgi Imaging Series) A. K. Gupta - Diagnostic Radiology_ Gastrointestinal and Hepatobiliary Imaging-Jaypee Brothers Medical Publishers (2008)
6. (Aiims-mamc-pgi Imaging Series) A. K. Gupta, Niranjana Khandelwal, Veena Chowdhury - Diagnostic Radiology_ Genitourinary Imaging-Jaypee Brothers Medical Publishers (2009)