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 III

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THIRD SEMESTER

Subject Type		Course Code	Subject	Credit Distribution			Credit	Mode of Delivery	Proposed MOOCs
				L	T	P			
CC	CC5	DHT301	Introduction to Clinical Pharmacotherapeutics	4			6	Offline/Blended	As per MAKAUT Notification
		DHT391	Introduction to Clinical Pharmacotherapeutics (P)			2		Offline/Blended	
	CC6	DHT302	Medical Instrumentation and its Applications	4			6	Offline/Blended	
		DHT392	Medical Instrumentation and its Applications(P)			2		Offline/Blended	
	CC7	DHT303	Clinical Terminology Systems and Interoperability	4			6	Offline/Blended	
		DHT393	Clinical Terminology Systems and Interoperability(P)			2		Offline/Blended	
GE	GE3		GE BASKET 1/2/3/4/5	4			4	Offline/Online	
SEC	SEC1	DHT304	Telemedicine Platforms	1		1	2	Online	
Semester Total Credits							**26**		

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DETAILED CONTENTS
THIRD SEMESTER

Core Courses
INTRODUCTION TO CLINICAL PHARMACOTHERAPEUTICS

(DHT 301)

Code: DHT 301

This course is designed to enable students to acquire understanding of drugs, pharmacodynamics, pharmacokinetics, principles of therapeutics and clinical implications.

Credits: 4

OBJECTIVES:

1. To enable students to understand the basic concepts of pharmacology and its clinical uses
2. To enable students to understand the pharmacology of common chemotherapeutics.
3. To enable students to understand the functions of drugs acting on various systems of the human body
4. To enable students to understand the interactions between the different drugs if administered together
5. To enable students to understand the interpretation of prescriptions generated by clinicians

COURSE OUTCOMES (CO):

On completion of the course, students will be able to:

CO1. Explain how drugs are named and classified

CO2. Explain the mechanisms of action of the commonly prescribed drugs

CO3. Explain the side-effects and drug interactions of the commonly prescribed drugs

CO4. Interpret the prescriptions and explain the advice to the patients

CO5. Explain how pharmacodynamics and pharmacokinetics influence the clinical usage of drugs

UNIT	CONTENT	HRS.
I	**Introduction to Clinical Pharmacotherapeutics:** Definitions • Sources • Terminology use • Types: Classification • Pharmacodynamics: Actions, therapeutic, Adverse, toxic effects. • Pharmacokinetics: Absorption, distribution, metabolism, interaction, excretion • Review: Routes and principles of administration of drugs • Indian pharmacopoeia: Legal issues • Storage of various drugs • Calculation of drugs dosage • Rational use of drugs • Principles of therapeutics	5
II	**Classification and mechanisms of action of the drugs** Drugs classified according to •mechanisms of action • site of action Single molecule having different uses with some examples• Drugs	14

	acting on different systems • cardiovascular•respiratory •gastrointestinal•genitourinary•nervous system	
III	**Pharmacology of commonly used Antibiotics and Antiseptics:** Antibacterials, Antiparasitic agents, antihelminthics, antifungals, antivirals, vaccines	11
IV	**Adverse Effects of the commonly used drugs and their interactions with food and other drugs:** Class side effects• individual side effects• anaphylaxis and other allergic reactions•timing of administration of drugs• food-drug interactions• fluid-drug interactions during intravenous administration• drug-drug interactions• management of common side effects• black box warnings•pharmacovigilance	10
V	**Choice of drugs and dosage according to body weight, body surface area and age:** Concepts of first line and second line drugs• dosage according to age• dosage as per body weight• dosage as per body surface area• generics vs brands• antibiotic resistance	4
VI	**Rational prescriptions and standard nomenclature:** Components of a prescription•nomenclatures of route of administration•nomenclatures of frequency of administration• How to avoid prescription errors• How to interpret a prescription• Compliance	8

Text/ Reference Books:

1. Satoskar, Bhandarkar, Ainapure: Pharmacology and Pharmacotherapeutics, 18 Edition Popular Prakashan Mumbai.

2. M M Das: Pharmacology, Books & Allied (p) Ltd, 4 Edition 2001.

3. Linda, Skidmore Roth: Mosby's 2000 Nursing Drug Reference, Mosby Inc, Harcourt Health Sciences Company, Missouri 2000.

4. Ramesh Karmegan: First aid to Pharmacology for undergraduates, Paras Medical publishers, Hyderabad, India, 1 Edition 2003.

5. K D Tripathi: Essentials of Medical Pharmacology, 4 Editions, Jaypee Brothers, Bangalore.

6. Govoni & Hayes: Drugs and nursing implications, 8 Edition, Appleton & Lange Newyork.

7. Rodman & Smith: Clinical pharmacology in nursing, 2 Edition, J B Lippincott company, Philadelphia.

8. Richard A Lehne : Pharmacology for nursing care , 3 Edition ,W B S aunderers company , Philadelphia, 1990.

9. Dr. Himanshu Baweja : Textbook Of Pharmacotherapeutics (Pharma D) 2nd Year Students As Per PCI Syllabus

10. CIMS DRUG MONITOR: CIMS 2022 & IDR 2022 (JAN TO APRIL 2022) pack of 2 books

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INTRODUCTION TO CLINICAL PHARMACOTHERAPEUTICS (P)

(DHT 391)

Code: DHT 391

Credits: 2

OBJECTIVES: To enable students to understand the prescriptions and have a working idea of the drugs, their effects and side-effects

COURSE OUTCOMES (CO):

On completion of the course students will be able to:

CO1: Interpret a prescription

CO2: Understand why a drug has been prescribed

CO3: Detect errors while transcribing

CO4: Understand the methods of administration

CO5: Understand the contraindications of commonly used agents

CO6: Transliterate a prescription in the local language

CO7: Able to report the adverse events in a prescribed format

LIST OF EXPERIMENTS:

1. Generate a basic prescription
2. Interpretation of a prescription from the Emergency Department
3. Interpretation of the prescription for a patient with Diabetes Mellitus
4. Interpretation of the prescription for a patient with acute watery diarrhea
5. Interpretation of the prescription for a patient with acute respiratory tract infection
6. Interpretation of the prescription for a patient with backache
7. Interpretation of the prescription for a patient with snakebite

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MEDICAL INSTRUMENTATION AND ITS APPLICATIONS

(DHT 302)

Code: DHT 302

Credits: 4

OBJECTIVES:

6. To enable students to have knowledge of the working principles and use of the Biomedical Instruments.
7. To enable students to have knowledge of the use of Biomedical Instruments in relation to Telemedicine.
8. To enable students to have knowledge of the issues of safety and safety methods for using Biomedical Instrumentation.

COURSE OUTCOMES (CO):

On completion of the course, students will be able to:

CO1. Explain how various biomedical signals and parameters are measured with accuracy, precision and resolution.

CO2. Explain the working principles and mode of operations of various biomedical instruments.

CO3. Explain electrical safety and relevant protection systems concerning medical instrumentation

CO4. Analyse the static and dynamic characteristics of bioinstrumentation systems

CO5. Explain different patient monitoring systems and their use in Biotelemetry.

UNIT	CONTENT	HRS.
I	**Introduction to Medical Instrumentation:** Sources of Biomedical Signals, Basic medical Instrumentation system, Performance requirements of medical Instrumentation system, Microprocessors in medical instruments, PC based medical Instruments, General constraints in design of medical Instrumentation system, Regulation of Medical devices, Use of Biomedical Instrumentation in Telemedicine.	5
II	**Measurement, Display & Recording Systems:** Units and standards of measurements, systematic and random error, accuracy and precision index, linearity, hysteresis, threshold, sensitivity, speed of response, fidelity, calibration, digital voltmeter & multimeter, PMMC, MI and dynamometer type instruments, dc potentiometers, AC bridges, general features of ink-jet, thermo-sensitive and optical recorders, CRT, General purpose oscilloscope, Dual trace, Dual beam, Sampling oscilloscope, Digital storage oscilloscope, Function generator.	14

III	**Biosignal Measurement Systems:** Biosignals characteristics, frequency and amplitude ranges, ECG-Einthoven's triangle, standard 12 lead system, Principles of vector cardiography, ECG block diagram and circuits. Evoked potential, EEG-10-20 electrode system, unipolar, bipolar and average mode, EEG bio-feedback instrumentation. EMG-unipolar and bipolar mode, EMG bio-feedback instrumentation, Recording of EOG, Blood ERG, EGG, PCG & GSR	11
IV	**Bioamplifier & Signal Conditioning Circuits:** Bio-amplifier and its characteristics, single ended bio-amplifier, differential bioamplifier, Impedance matching circuit, isolation amplifiers-transformer and optical isolation, isolated DC amplifier and AC carrier amplifier, Power line interference, Right leg driven ECG amplifier, Band pass and notch filtering, data acquisition system.	10
V	**Biomedical Scanners:** CT Scanner and its working principle, MRI Scanner and its working Principle	4
VI	**Patient Monitoring Systems & Biotelemetry:** Introduction to patient monitoring system, selection of parameters, computerized patient monitoring system, bedside and central monitoring system, heart rate monitor, pulse rate monitor, Holter monitor and Cardiac stress test, Cardiac catheterization instrumentation, phonocardiography, Organization and equipment used in ICCU & ITU, Internet connectivity of the biomedical equipment and their remote operations.	8

Text/ Reference Books:

1. R. S. Khandpur "Handbook of Bio-Medical Instrumentation", 2nd Edition, Tata McGraw Hill.

2. J.J. Carr & J. M. Brown, "Introduction to Biomedical Equipment Technology" Pearson Education, Asia.

3. Cromwell, Weibell & Pfeiffer, "Biomedical Instrumentation & Measurement", Prentice Hall, India

4. Joseph Bronzino, "Biomedical Engineering and Instrumentation", PWS Engg . , Boston

5. J. Webster, "Bioinstrumentation", Wiley & Sons.

6. Joseph D. Bronzino, "The Biomedical Engineering handbook", CRC Press.

7. Kyriacou, E., Pavlopoulos, S., Berler, A. *et al.* Multi-purpose HealthCare Telemedicine Systems with mobile communication link support. *BioMed Eng OnLine* **2,** 7 (2003).

8. K. Subbaraj, "CT Scanning – Techniques and Applications", InTech, Croatia, 2011

9. Geraldine Burghart & Carol Ann Finn, "Handbook of MRI Scanning", Elsevier, 2012

10. Das, B.K. (2015). Basic Principles of CT Imaging. In: Das, B. (eds) Positron Emission Tomography. Springer, New Delhi.

11. Kagawa, T., Yoshida, S., Shiraishi, T. *et al.* Basic principles of magnetic resonance imaging for beginner oral and maxillofacial radiologists. *Oral Radiol* **33,** 92–100 (2017).

MEDICAL INSTRUMENTATION AND ITS APPLICATIONS (P)

(DHT 392)

Code: DHT 392

Credits: 2

OBJECTIVES: To enable students to use different kinds of Biomedical Instruments

COURSE OUTCOMES (CO):

On completion of the course students will be able to:

CO1: Use Biomedical Instruments like Stethoscope, Heart rate Monitor, Pressure Monitor

CO2: Use ECG Equipment

CO3: Use EEG Equipment

CO4: Use EMG Equipment

CO5: Explain the use of CT scanner

CO6: Explain the use of MRI scanner

CO7: Explain the use of Patient Monitoring System

LIST OF EXPERIMENTS:

1. Study and Use of Stethoscope (both electronic and traditional)

2. Study and use of Heart Rate monitor

2. Study of Pressure Monitor (both Electronic and Traditional)

3. Study of ECG equipment and recording, analysis and interpretation of ECG Signals

4. Study of EEG equipment and recording, analysis and interpretation of EEG Signals

5. Study of EMG equipment and recording, analysis and interpretation of EMG Signals

7. Study of CT scanner

8. Study of MRI Scanner

9. Study of Patient Monitoring System

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Clinical Terminology Systems and Interoperability (DHT303)

Full marks: 100
Credit: 4
Lecture period: 40 hrs

Course Objectives: This course is designed to acquaint students with concept of interoperability and Standards for exchange of healthcare information

COURSE OUTCOMES:
On Completion of the Course, Students will be able to:
CO1: Explain the basics and components of
CO2: Describe the components of
CO3: Identify the scope of
CO4: Enumerate the different

Contents: (4 Modules, each for 10 hours)

UNIT 1: Introduction
- Standards and Interoperability for exchange of Health Information
- Medical databases
- Web tools for healthcare
- Application Programming Interfaces or APIs for healthcare

UNIT 2: Types of Interoperability
- Technology Layer
- Data Layer
- Human Layer
- Institutional Layer

UNIT 3: Standards for exchange of Healthcare Information
- Categories of Standards
- Vocabulary Standards (such as ICD, LOINC, and SNOMED CT)
- Content Standards (such as DICOM and HL7 FHIR)
- Transport Standards (*e.g.*, XML and JSON)

UNIT 4: Overview
- Comparison between ICD and SNOMED CT
- Changes in ICD 10 and ICD 11
- SNOMED CT: Concept, Description, Relationships and Hierarchies
- Harmonization of diverse Standards

Suggested Reading:

Textbooks:

1. Benson T and Grieve G, Principles of Health Interoperability, SNOMED CT, HL7 and FHIR, 3rd Ed, Springer-Verlag, London, 2016

References:

1. WHO, ICD-10 Browser: https://icd.who.int/browse10/2019/en
2. WHO, ICD-11 Browser: https://icd.who.int/browse11/l-m/en
3. SNOMED International, SNOMED CT Browser: https://browser.ihtsdotools.org/
4. National Resource Centre for EHR Standards: https://www.nrces.in/

Clinical Terminology Systems and Interoperability (P)
(DHT 393)

Full marks: 100
Credit: 2
Lecture period: 40 hrs

Course Objectives: This course is designed to acquaint students with practicals of interoperability and Standards for exchange of healthcare information

COURSE OUTCOMES:

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

CO1: Identify the scope of diverse standards required for meaningful exchange of healthcare information.
CO2: Use the appropriate standard for the optimal purpose

List of Experiments:

1. Exploring the various toolkits available at the NRCeS
2. Exploring the SNOMED CT Browser for finding solutions to problems given
3. Exploring the ICD 10 Browser for finding solutions to problems given
4. Exploring the ICD 11 Browser for finding solutions to problems given

Suggested Reading:

1. WHO, ICD-10 Browser: https://icd.who.int/browse10/2019/en
2. WHO, ICD-11 Browser: https://icd.who.int/browse11/l-m/en
3. SNOMED International, SNOMED CT Browser: https://browser.ihtsdotools.org/
4. National Resource Centre for EHR Standards: https://www.nrces.in/

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Telemedicine Platforms
(DHT 304)

Full marks: 100
Credit: 2
Online Lecture + Practical period: 40 hrs

Course Objectives: This course is designed to acquaint students with concept of various online platforms for Telemedicine

COURSE OUTCOMES:

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

CO1: Explain the basic concepts of telemedicine platforms
CO2: Describe the components of telemedicine platforms
CO3: Identify the scope of telemedicine platforms
CO4: Use at least one telemedicine platform

Lecture Topics and List of Experiments:

- How does a telemedicine platform enable virtual medical consultations
- The key elements of a telemedicine platform
  - Consult Coordination
  - Consult Delivery
  - Consult Satisfaction
  - Consult Quality
- The benefits of a telemedicine platform
- How does a telemedicine platform drive clinical quality
- How does a telemedicine platform help optimize outcomes
- Why is it important for a telemedicine platform to be scalable
- Why should a telemedicine platform be flexible
- What makes a telemedicine platform innovative
- How should a telemedicine platform integrate with existing technology
- Explore a working telemedicine platform such as edocsmc.in

Suggested Reading:

1. https://www.soctelemed.com/resources/telemedicine-glossary/what-is-a-telemedicine-platform/
2. https://telemedregistry.in/
3. https://apps.who.int/iris/bitstream/handle/10665/350199/Telehealth-PHC-eng.pdf
4. https://edocsmc.in/
5. https://innovations.bmj.com/content/7/3/580.info
6. https://esanjeevaniopd.in/Home