Post Graduate Diploma in Medical Ultrasound (PGDMU) Program

PGDMU Program

Handbook

বাংলাদেশ উন্মুক্ত বিশ্ববিদ্যালয়

BANGLADESH OPEN UNIVERSITY

SCHOOL OF SCIENCE AND TECHNOLOGY

Academic Programs of the School of Science and Technology

B.Sc. in Computer Science and Engineering (CSE) Program

The B.Sc. in Computer Science and Engineering (CSE) program provides the learners an opportunity to obtain broad knowledge about Computer Science, Computer Engineering with some freedom to tailor the program according to the learner's individual needs. The objectives of the program are to produce engineers with the technical knowledge, skills, application, creativity and self-development in computer science. The minimum entry requirement into the program is GPA 2.5 /2nd division in HSC/equivalent examinations in science groups. It is a 148 credits program divided into eight semesters (four years). The courses of this program consist of theoretical , practical, project work and viva-voce.

Diploma in Computer Science and Application (DCSA) Program

The objectives of DCSA program are to develop skill in computer and its area of application such as office automation, computer networking, database management systems, computer aided design, troubleshooting, computer programming, software development etc. It is a 35 credits program. The duration of the program is ordinarily is one and half academic years divided into three semesters. to complete the program. The minimum entry requirement into the program is GPA 2.5 /2nd division in SSC/equivalent examinations preference will be given to in science groups.

Bachelor of Science in Nursing (BSN) Program

The program aims are to prepare professional nurse with the highest possible technical and managerial competence in respective level of health programs, including problem identification, planning, training, evaluation and research. The general objective of the post-basic B.Sc. in nursing program is to produce competent graduates with advanced knowledge and practical skills necessary to deliver high quality health services needed for the patients in home and abroad. The duration of the program is three years. The minimum entry requirement into the program is Diploma in Nursing and Midwifery with 3 years professional experiences. Currently, the admission into the program is held up.

Master of Disability Management and Rehabilitation (MDMR) Program

The aims and objectives of the MDMR program are to enhancing quality of disability management and rehabilitation services to general population. That produce competent and skilled manpower in the field of rehabilitation and disability management sectors. The duration of the program is two years (four semesters). A learner has to complete 72 credits to receive the degree. The eligible criteria for admission into the program is graduate from Physiotherapy/Occupational therapy/Speech & Language Therapy/MBBS/BDS/B.Sc. in Nursing/ BHMS/BUMS/BAMS/ Biological Science / Social Science or relevant degree.

Master of Public Health (MPH) Program

The aims and objectives of the MPH program are to produce competent and skilled manpower in the field of public and community allied health, health administration, leadership and research who will be able to attain the national health goals through their effective contribution in health profession. The duration of the program is two years (four semesters). A learner has to complete 60 credits to receive the degree. Beside theory courses, a dissertation report will be submitted and presented it as defense; also has to appear in comprehensive viva-voce at the end of 4th semester. The eligible criteria for admission into the program is graduate from any discipline; preference will be given to candidates who have graduated from medical science, dentistry, nursing and allied health sciences professionals.

Post Graduate Diploma in Medical Ultrasound (PGDMU)

The aims and objectives of the program are to produce sufficient sonologists with necessary knowledge and skill about ultrasound to take care of community health. The duration of the program is one year (two semesters). A learner has to complete 30 credits to receive the degree. A learner has also to submit a case study report and appear in comprehensive viva-voce at the end of each semester. The eligible criteria for admission into the program is MBBS or MD.

Upcoming Programs

Master of Science in Software Engineering Program

It is a one and half years (3 semesters) and 36 credits program. The program is designed for both working professionals and students who want to lead the way in software development – one of the fastest growing areas in IT. The eligible criteria for admission into the program are bachelor's degree in Computer Science/Computer Science and Engineering/ Information Technology/ Electrical and Electronic Engineering/ Physics/Applied Physics or related areas.

M.Sc. in Pharmacology

It is a two years (4 semesters) and 57 credits program. The minimum qualification for admission into the program is B.Sc. in biological sciences (Pharmacy, Botany, Zoology, Chemistry, Biochemistry, Microbiology and Dentistry) with at least CGPA 2.5 out of 4 or passes from B.Sc. in Nursing, DVM and MBBS.

B.Sc. (Hons) in Food Science and Nutrition Program

It is a four years (eight semesters) and 153 credits honours program. The eligible criteria for admission into the program are passed from HSC science group/diploma from institutes of health technology (IHT)/ agriculture institutes with GPA (2.00)/CGPA (2.75) and biology and chemistry.

Postgraduate Diploma in Early Childhood Development Program

The objective of the program is to develop human resources in the field of early childhood development, early learning and parenting. The minimum qualification for admission into the program is graduation from arts, commerce and sciences with at least CGPA 2.5 out of 4.

Diploma in Community Health Care (DCHC) Program

It is a one year program. The program is especially designed for medicine business man, health worker, health assistant and village practitioner. The minimum qualification for admission into the program is SSC or equivalent pass.

Diploma in Pharmacy Program

It is a four years (eight semesters) program. The program is designed for those who intend to develop their career as a medicine business man, village practitioner, hospital/clinic/health complex pharmacist and pursue higher study in pharmacy. The minimum qualification for admission into the program is SSC or equivalent pass with GPA 2.5; preference will be given to candidates who have passed SSC/equivalent from science group.

M. Phil. and Ph.D. Programs

M.Phil. (two years) and Ph.D. (three years) programs in the field of computer and biological sciences will be started soon.

POST GRADUATE DIPLOMA IN MEDICAL ULTRASOUND (PGDMU) PROGRAM

1.0 Background of the Program

Bangladesh Open University (BOU) offers education in distance mode for all levels of learners of the society using different types of educational technologies. The main objective of BOU is to create skill manpower by providing need based education especially for women, people of rural/remote areas, unskilled work-force and disadvantaged learners who are unable to enroll in the conventional educational institution. Usually teaching- learning takes place by the use of Self-Instructional Materials (SIM) by print materials, audio-video supported educational program, face to face counseling and guidance, group study etc.

It is well recognized that Ultrasound is very scientific,useful and cost effective method compared to Computed Tomography (CT) scan and Magnetic Resonance Imaging (MRI) scans in terms of diagnosis. The field of sonography is highly specialized medical investagition which has large employment oppurtunities both at home and abroad.

In Bangladesh, there are few public and private institutions that offer training program in clinical ultrasound. BOU is the only public university which offers ultrasound education throughout the country and may accommodate huge number of learners. Considering the growing demands from both learners and the job market.The School of Science and Technology (SST) has launched **Post Graduate Diploma in Medical Ultrasound (PGDMU)** for providing practical and effective academic knowledge of its learners in medical ultrasound by using blended mode (conventional and distance education mode) of delivery.

1.1 Name of the Program

Post Graduate Diploma in Medical Ultrasound, in short, **PGDMU**.

1.2 Aims and Objectives of the Program

1.2.1 To create opportunity for acquiring knowledge and skill in Medical Ultrasound.
1.2.2 To produce sufficient sonologists available for taking care of community health.
1.2.3 To train up medical doctors for effective and scientific diagnosis of patients and writing reports on case basis using ultrasound machine.
1.2.4 To produce trained and skilled sonologists to meet the growing demand in clinical ultrasound and imaging at home and abroad.

1.3 Target Group

Medical doctors (MBBS or MD) from home and abroad.

2.3 Employment Opportunity

Medical centers, public and private clinics and hospitals, academic instuitions, bio-science, bio-medical and medical technology sectors at home and abroad.

3.3 Admission Requirements

3.1 Candidates must have MBBS or equivalent degree having registration from Bangladesh Medical and Dental Council (BMDC).
3.2 Basic skill in computer literacy..

4.0 Number of Seats

A maximum of 40 to 50 learners will be admitted at each study center. The number of seats may also vary as per decision of the BOU authority.

5.0 Admission Procedure

5.1 Collection of Admission Form

Admission Form and Learners Guide may be collected from the Regional Center (RC) or website after advertisement for admission into the program in national daily newspapers, TV and BOU Website

5.2 Submission of Admission Form

Properly filled up prescribed Application Form should be submitted along with the following documents to the local Regional Center.

- Attested copies of certificates and marks- sheets of Bachelors/Masters or equivalent examinations.
- 3 copies of an attested passport size photographs.
- National Identity Card (if available).
- Bank receipt copy of necessary fees as per BOU rules for application.

6.0 Selection Criteria

(i) Learners will be selected to the PGDMU Program on the basis of merit and number of applicants.

(ii) If the number of applicants will more than the number of available seats; in that cases, learners will be selected according to merit of admission test. Applicants will appear in a 80 marks MCQ typed written test consisting of questions from. Human Anatomy and Physiology, Bio-Physics and also 20 Marks of viva-voce. Duration of the admission test will be 1 hour . The marks distributions is given below-

Subjects	**Marks**
Human Anatomy and Physiology	60
Bio-Physics	20
Viva-voice	20
Total	**100**

(iii) Quotas shall be followed as per Govt. rules.

7.0 Program Plan

Duration of the program	:	1 Year.
Total Semester	:	2 Semester
Semester length	:	6 Months
Total Credits	:	30 Credits

8.0 Medium of Instruction

Medium of instruction of the Post Graduate Diploma in Medical Ultrasound (PGDMU) Program shall be in English.

9.0 Enrollment of Students into the Program

Application will be invited once in an academic year.

10.0 Fees Structure for the PGDMU program

Tentitive Fee's and Cost Involved with Post Graduate Diploma in Medical Ultrasound Program:

Descriptions	Semester	
	1st	2nd
Application Form and Admission Guide	1000	0
Course Fee (5 Course/Learner's)	6000×5=30000	6000×5=30000
Registration Fee	1000	1000
ID Card Fee	200	0
Examination Fee for 5 course	5000	5000
Library Fee	100	0
Semester Mark Sheet	100	100
Provisional Certificate	0	400
Main Certificate	0	500
Transcript	0	400
Final Mark Sheet	0	300
Academic Calendar Fee	100	100
Seminer Fee	3000	5000
Others	500	0
Total Fees per Semester	**41000**	**42800**

11.0 Program Registration Duration

The duration of the Post Graduate Diploma in Medical Ultrasound (PGDMU) Program shall be ONE (01) academic year divided into TWO (02) semesters. Each semester consists of six (6) months. A learner shall normally, be allowed a maximum period of TWO (02) academic years (i.e. consecutive 04 semesters) to obtain her/his Degree.

12.0 Cancellation of Program Registration

In the event of any misconduct or breach of any of the relevant Regulations of the BOU by any learner, the University may take necessary disciplinary action against the learner concerned as per the BOU Rules.

13.0 Learner's Identification Number

Each enrolled learner shall be given a specific 'Learner's Identification (ID) Number at the time of his/her admission in to the program. The learner must write complete ID number for all purposes like assignments, examination, and communication with BOU and so on. The ID number shall have to be mentioned on the ID card of the learner and on the Registration Card.

Dummy Id	1	8	0	-	5	7	-	8	1	0	-	0	0	7

14.0 Course Registration in Each Semester

In the beginning of each semester, the learners have to complete the requirements for registration only for the courses in the respected semester. A Learner must take all five courses in a semester. If any learner want to continue in his/her semester, they are required to register in at least 2 (two) courses in a Semester.

15.0 Academic Year and Semester of the Program

The academic year of the program shall start from **January/July** of each calendar year and shall end in **December/June** of the same year. Tentative Schedule of the activities in each academic year shall be divided into two semesters as follows:

Semester	Duration
1st Semester	January-June
2nd Semester	July-December

16.0 Semester Wise Course Distribution

16.1 First Semester — Credits : 15

Sl. No.	Course Code	Course Title	Credits
1.	PGDMU 1301	Physics and Instrumentation of Ultrasound*	3
2.	PGDMU 1302	Cross-sectional Anatomy and Pathophysiology-I*	3
3.	PGDMU 1403	Ultrasound of Adult and Pediatrics Abdomen*	4
4.	PGDMU 1304	Ultrasound of Superficial Structure*	3
5.	PGDMU 1205	Comprehensive Training - I	2
		Total	**15**

*****Including both theory and practical sessions

16.2 Second Semester — Credits : 15

Sl. No.	Course Code	Course Title	Credits
1.	PGDMU 2306	Cross-ectional Anatomy and Pathophysiology-II*	3
2.	PGDMU 2407	Obstetrics and Gynaecological Ultrasound *	4
3.	PGDMU 2308	Neurosonology and Vascular Ultrasound *	3
4.	PGDMU 2209	Clinical Ultrasonography and other Diagnostic Imaging Modalities*	2
5.	PGDMU 2310	Comprehensive Training- II	3
		Total	**15**

*****Including both theory and practical sessions

17.0 Teaching Learning Activities

- Face-to-face mode of delivery;
- Review of Practice Session;
- Mid-term Assignment/Class Test/Quiz;
- Slide Presentation/Case study; and
- Reports Writing.

18.0 Study Center

The School Committee shall recommend study center for the program after considering faculty, communication, laboratory facilities, physical and other facilities of the prospective center; final approval of the study center will be given by the University authority.

19.0 Study Materials and Instruments

a. On payment of requisite semester/course fees, Instructional materials/course guideline/ module will be distributed to the learners at the time of registration of respective semester or at the time enrollment to the program.

b. Post Graduate Diploma in Medical Ultrasound (PGDMU) program has been designed for the professionals only. School of Science and Technology (SST) will not provide study materials of this professional program because health related any information has been update rigorously and new ideas replacing the old ones. For these reason, school will provide course wise study guide that will follow the weekly tutorial sessions based on the syllabus.
c. During each semester, face-to-face tutorial sessions for every course shall be arranged on specific Friday and/or Saturday at the approved Study Centers (SC).

20.0 Tutorial Sessions

Tutorial sessions will be conducted on Friday and Saturday. Four hours of practical work or clinical practice will be arranged for each group consisting of five to six learners in every week.

21.0 Tutorial Services

The methodology of instruction of the university is different from that of the conventional universities. The system of Bangladesh Open University is more learner-oriented and the learner has to be an active participant in the teaching-learning process. Bangladesh Open University uses a mix of media considering the access and affordability of the learners. Both synchronous and asynchronous media are used for the effective delivery of the courses. Most of the instruction is imparted through a distance communication with only a small component of face-to-face communication. The University follows a multi-channel approach for instruction and it comprises a suitable mix of multifarious learning modes. such as,

- Reference books;
- CD/DVD, STD card containing lectures of the courses;
- Video lectures on YouTube, Face book and Twitter;
- Video programs transmitted through national TV;
- Face-to-face class room;
- Web based learning system support;
- Interactive virtual class supports;
- Assignments, Practical and
- Project work.

21.1 Tutorial Service and Study Center

In BOU system all classes are arranged in the particular institutions. An institution selected by the BOU for counseling is called a study center (SC). In BOU system, tutorial class is optional. Learner comes to the study center to solve their course-related problems and to get necessary information of the program. Since the program is science based and technical, large numbers of lab/field are included in the syllabus, in that cases, tutorial classes are mandatory. So learners are advised to attend the tutorial classes regularly. There is a mark for class attendance.

21.2 Is it Necessary to Attend in the Tutorial Classes?

The program is technical and practical based, so learners are advised to attend in the tutorial classes regularly. A log book will be provided from the School of Science and Technology, BOU for recording both the theoretical and practical hours. It must be preserved by the course tutors and learners and submitted at the end of each semester for evaluation.

21.3 Tutorial Class Time

The tutorial classes are conducted as per the academic calendar of the program. We advise learners to follow the academic calendar and class schedule. Before attending the sessional class for each course, please go through your course material as per the session schedule and make a plan of the points to be discussed. Unless you have gone through the Units, there may not be much to discuss and your study may not be fruitful. Tutorial classes are conducted in convenient schedule: mainly on Fridays and Saturdays.

22.0 Evaluation procedure and Marks Distribution

Performance will be evaluated by using the following sections for each course and each section have equal defined marks:

22.1 Theory Courses including Practical Demonstrations:

a. Theory: MCQ short and Analytical Questions — 70 marks
b. Quizzes/Class Test/Slide Presentation/Case Study — 15 marks
c. Practical Demonstrations/Report Writing — 15 marks

Total 100 marks

Question Pattern and Marks Distribution

Sl. No.	Question Pattern	Brief Description	Marks
a)	MCQ Questions/Objective	40 Questions	40 × 0.5 = 20 marks
b)	Analytical Questions	Will be answered 10 out of 14	10 × 5 = 50 marks
c)	Slide Presentation/Case Study	2 Presentation on Spot	7.5 × 2 = 15 marks
d)	Ultrasound Report Writing	2 cases out of 3	7.5 × 2 = 15 marks
Total			**100 marks**

22.2 Comprehensive Training - I and II

a) Practical Session: 60 marks
b) Viva-voce: 40 marks

Total 100 marks

Practical session and viva-voce will be carried on the following headings-

(a) Case Diagnosis with Patient — **60 marks**

i) Questions on ultrasound system
ii) Diagnosis of cases
iii) Performance with patient

(b) Viva-voce — **40 marks**

i) Doctor patient relationship evaluation
ii) Comprehensive viva-voce

23.0 Duration of Examination

The duration written examination will be 3 (three) hours.

24.0 Tenure of Registration

The registration of a learner in the Post Graduate Diploma in Medical Ultrasound (PGDMU) Program shall remain valid for a period of 2 years (i.e., for consecutive 4 semesters) since her/his admission into the program, unless the leaner falls under any of the following categories:

- ❖ Cancellation or suspension of registration, or
- ❖ Discontinuation, or
- ❖ Expulsion for adopting unfair means.

25.0 'DE-NOVO' Registration

If any learner fails to complete the program within registration period of two years, he/she may get the chance of ***de-novo registration.*** But the learners failing to complete at least Six (06) courses or 60% of the total courses during the period of first two years may not be allowed to apply for the de-novo registration. Interested learners shall have to apply to the School in prescribed form for de-novo registration. Under de-novo registration, learners with expired initial registration will be allowed for further one year as new admission to finished his/her remaining course successfully. In that cases, such learners will be allowed exemption from the courses they had successfully completed earlier.

26.0 Activities which would Constitute Unfair Means

(a) The following activities would constitute unfair means: -
  (i) Copying from another learner's assignment/script/paper;
  (ii) Copying from writings on the desk, or palm of a hand, or from other incriminating documents;
  (iii) Possession of any incriminating document whether used or not; and
  (iv) Unruly behavior or misbehaviour with the invigilator.

(b) Adoption of unfair means shall result in the punishment of a leaner as per the Disciplinary Rules of the BOU.

27.0 Re-evaluation of Answer-script(s)

Re-evaluation of any script shall not be considerd.

28.0 Preparation of Result

The result of the Post Graduate Diploma in Medical Ultrasound (PGDMU) examination will be processed and prepared by the Examination Committee.

29.0 Pass Marks

60% (sixty percent) marks will be considered as pass marks.

30.0 Grading System

The total performance of a student in a given course is based on a scheme of continuous assessment. For theory courses this continuous assessment is made through a set of quizzes, class evaluation, class participation, homework assignment and a semester final examination.

Each course has certain number of credits, which describes its corresponding weight. A learner's performance is measured by the number of credits completed satisfactorily and by the weighted average of the grade points earned. A minimum Grade Point Average (GPA) is essential for satisfactory progress. A minimum number of earned credits also have to be acquired in order to qualify for the degree. Letter grades and corresponding grade points are given as follows.

Results will be given in accordance with GPA system (if applicable). An equivalence for grade point is shown in the following table:

Numerical Grade	Letter Grade	Grade Point
80% or above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
Less than 60%	F	0.00

31.0 Requirement for obtaining degree of Post Graduate Diploma in Medical Ultrasound (PGDMU)

Marks obtained in the theoretical and oral examination will be evaluated separately and the passed marks will be 60% for each component separately that will be added together for considering the pass mark. To obtain the PGDMU degree, a learner should –

- Successfully complete of all 10 (Ten) courses as well as complete of 30 credits.
- Obtain a minimum of 60% marks in each course.
- Obtain a minimum grade of 'B' in each course,
- Secure a minimum 'Cumulative Grade Point Average (CGPA)' of 3.0. (B)
- Complete the program within 2 (Two) academic years since her/his 1st admission into the program.

32.0 Transcript and certificate

Learner shall get marksheet for each semester. Learners shall get transcript and provisional certificate after graduation. The original certificate shall be issued only as per BOU of rules.

33.0 Remuneration

All remunerations related to Post Graduate Diploma in Medical Ultrasound (PGDMU) program shall be given as per BOU rules.

34.0 Removal of Difficulties and Saving

Academic matter, if any, regarding the Post Graduate Diploma in Medical Ultrasound Program is not covered by this regulation shall be dealt with the Vice-Chancellor provided that before taking any action the Vice-Chancellor shall ascertain and consider the opinion of the School Committee.

35.0 Addition, Alteration, Change or Modification in the Regulations

The School Committee shall have the power to propose any addition, alteration, change, and modification in the Regulations for the approval of the Academic Council.

Detailed Syllabus of Post Graduate Diploma in Medical Ultrasound (PGDMU) Program

1st Semester

Course Code	Course Title	Credit
PGDMU 1301	**Physics and Instrumentation of Ultrasound**	**03**
Course Objectives	Medical ultrasound is a diagnostic imaging technique based on the application of ultrasound. It is used to see internal body structures such as tendons, muscles, joints, blood vessels and internal organs. Its aim is often to find a source of a disease or to exclude any pathology. The practice of examining pregnant women using ultrasound is called obstetric ultrasound, and is widely used. Learners will learn principles of ultrasound, the application of these principles to image production, and understanding of the equipment used in the practice of ultrasound. Topics include the internal components of various ultrasound scanners, the functions of the different scanners, quality control programs and possible biological effects of ultrasound.	
Textbook and References	1. WHO Manual of Diagnostic Ultrasound (2nd Edition) edited by Harald Lutz, Elisabetta Buscarini. 2. Diagnostic Ultrasound (4th Edition) by Carol M. Rumack MD FACR, Stephanie R. Wilson MD, J. William Charboneau MD, Deborah Levine MD 3. Understanding Ultrasound Physics (4th Edition) by Sidney K Edelman	

Course Contents:

Physics and Instrumentation of Ultrasound

1. **Introduction to Medical Ultrasound:** Definition of Sound, Types of Sound Waves, Cycle, Frequency, Velocity, Calculation of Ultrasound Frequency, Intensity, Attenuation.
2. **Responsible for attenuation of ultrasound beam:** Absorption, Reflection, Scattering raction, Diffraction, Interference.
3. **Differentinteractions of attenuation:** Acoustic Beam, Enhancement, Acoustic Shadowing, Near gain and Far gain control, Intensity Enhancement Time Gain Compensation (TGC).
4. **Resolution:** Types of resolution, Axial (depth) resolution, Lateral (horizontal) resolution, Slice thickness resolution, Relationship between probe frequency.
5. **Probe / Transducer:** Components of a Transducer, Piezoelectric Property, Piezoelectric Effect
6. **Types of Transducers:** Mechanical transducer, Electronic transducer, Linear transducer / rectangular, Convex or curvilinear transducer, TVS, TRS, Oesophagial probe., 3D, 4Dprobe,Transducer Frequency.
7. **Modes of Display:** A-mode (Amplitude mode), B-mode (Brightness mode), M-mode (Motion mode), Real Time imaging, Doppler mode .
8. **The Artifacts:** Reverberation Artifact, Comet Tail Artifact, Ring Down Artifact, Mirror Image Artifact, Shadows, Enhancement, Duplication (ghost), Slice thickness, Noise, Interface

9. **Bio-effects & Safety Measures of Diagnostic Ultrasound:** Effect of Ultrasound: Factors Increasing Bio-Effect, Thermal Effect, Thermal Index (TI), Pressure Effect, Mechanical Index, Chemical Effects.

Course Code	Course Title	Credit
PGDMU 1302	**Cross–Sectional Anatomy and Pathophysiology-1**	**03**
Course Objectives	Cross–Sectional Anatomy and Pathophysiology plays an important role to evaluate normal and abnormal structures of human body. In this module the learners will learn how to prepare for and perform an ultrasound examination of the abdomen, the interactive classes provides three different scan scenarios, including normal and pathological cases. It enables learners to build or refresh knowledge and cognitive skills, and offers a safe environment so learner can practice and prepare for the real clinical world.	
Textbook and References	1. WHO Manual of Diagnostic Ultrasound (2nd Edition) edited by Harald Lutz, Elisabetta Buscarini. 2. Diagnostic Ultrasound (4th Edition) by Carol M. Rumack MD FACR, Stephanie R. Wilson MD, J. William Charboneau MD, Deborah Levine MD 3. Understanding Ultrasound Physics (4th Edition) by Sidney K Edelman 4. Sonography: Introduction to Normal Structure and Function (4th Edition) by Reva Arnez Curry, PhD, Betty Bates Tempkin BA. 5. Sonography Scanning: Principles and Protocols (3rd Edition) by Betty Bates Tempkin BA 6. Prep Manual for Medical Graduates (Medical Ultrasound) – 6th Edition by Dr. Md. Jahidur Rashid	

Course Contents:

1. **LIVER: Normal Liver-** Ultrasonography Appearances, Variation, Assessment of Liver Size.
   The Portal Venous System: Sonographic Findings in Portal Hypertension
2. **GALLBLADDER AND BILIARY TREE:** Normal Appearance of the Biliary Tree, Gallbladder, Cystic Duct, Normal Anatomical Variants, Technique and Ultrasonography Appearance
3. **PANCREAS:** Normal Ultrasonography Appearances, Congenital Anomalies, Ectopia, Cysts, Imaging Techniques, Transabdominal Ultrasonography
4. **SPLEEN:** Normal Ultrasonography Appearances, Shape, Position, Anomalies. Special Techniques, Size Measurement
5. **KIDNEY:** Normal Appearances on Ultrasonography. Renal Anatomy, Techniques of Examination, Positioning and access, Renal Size, Cortical and Parenchymal thickness, The Renal sinus, collecting system and vessels, Congenital variants of renal structure and position.
6. **THE LOWER URINARY TRACT:**
   The Bladder: Equipment requirements and Techniques, Bladder Cancer, Ultrasonography.
   The Prostate: Techniques, Normal Ultrasonography Appearances.

Course Code	Course Title	Credit
PGDMU 1403	**Ultrasound of Adult and Pediatric Abdomen**	**04**
Course Objectives	Ultrasound is valuable for evaluating abdominal pain in adult and pediatric patients. This module teaches you how to prepare for and perform an ultrasound examination of the adult and pediatric abdomen, and to assess the common adult and pediatric pathologies. The learners will learnthe protocols for sonographic scanning of the adult and pediatric abdomen and additional considerations when imaging patients in the neonatal intensive care unit, to practice, perfect and test your skills in performing an ultrasound scan of the adult &pediatric abdomen, to better visualize and understand the anatomy and physiology of the adult &pediatric abdomen including differences between adult and neonatal abdominal anatomy.	
Textbook and References	1. WHO Manual of Diagnostic Ultrasound (2nd Edition) edited by Harald Lutz, Elisabetta Buscarini. 2. Diagnostic Ultrasound (4th Edition) by Carol M. Rumack MD FACR, Stephanie R. Wilson MD, J. William Charboneau MD, Deborah Levine MD 3. Understanding Ultrasound Physics (4th Edition) by Sidney K Edelman 4. Sonography: Introduction to Normal Structure and Function (4th Edition) by Reva Arnez Curry PhD RDMS RTR FSDMS, Betty Bates Tempkin BA. 5. Sonography Scanning: Principles and Protocols (3rd Edition) by Betty Bates Tempkin BA 6. Prep Manual for Medical Graduates (Medical Ultrasound) – 6th Edition by Dr. Md. Jahidur Rashid 7. Pediatric Sonography (Fourth Edition) by Marilyn J. Siegel MD (Editor)	

Course Contents:

1. **Pathologyof Haepatobiliary System:**

   Focal Liver Diseases-

   a. Benign: Simple Cyst, Polycystic Liver disease , Echinococcal Cyst (Hydatid Disease) Abscess, Pyogenic Abscess, Amoebic Abscess, Candidiasis, Haemangioma, Lipomas and Focal Fatty Change.

   b. Malignant: Hepatocellular Carcinoma, Ultrasonography Appearances, Growth pattern, Vascular Involvement, Ultrasonography Appearance, Biopsy Guidance.
2. **Diffuse Liver Diseases:** FattyInfiltration, Cirrhosis, Hepatitis, Biliary Cirrhosis
3. **Gallbladder Pathology:** Stones, Classical Appearances, Contracted Gallbladder ,Echogenic Bile/Biliary Sludge, Gallbladder Wall Thickening, Acute Cholecystitis, Polyps, Carcinoma.
4. **Bile Duct Pathology:** Jaundice, Bile Duct Dilatation, Obstruction without Dilatation, Dilatation without Jaundice, Choledocholithiasis.
5. **Pancreatic Inflammatory Diseases:** Acute Pancreatitis, Chronic Pancreatitis.
6. **Pancreatic Malignancy:** Clinical Features, Pathology, Ultrasonography Appearances
7. **Splenic Pathology:** Diffuse Diseases Focal Diseases, Lymphoma, Abscess, Inflammatory Pseudotumour, Metastases, Cysts, Tumours, Parasites.
8. **The Renal Collecting System:** Generalized Dilatation, Ultrasonography Appearance, Renal

Calculi, Ureteric Calculi. Renal Masses: Simple Renal Cysts, Diffuse Cystic Disease, Adult Polycystic Kidney Disease, Benign Tumours, Malignant Tumours, Renal Metastases. Renal Infections: Acute Pyelonephritis, Acute Bacterial Nephritis, Renal Abscess,Tuberculosis, Fungal infection Hydatid disease.

9. **Urinary Bladder:** Badder diverticula, Bladder stones, Foreign bodies, Blood clot, Suprapubic Catheterization.
10. **Prostate:** Prostate Cancer, benign Prostatic Hyperplasia, Prostatic Inflammatory Disease, Prostate Abscess, Prostatic Calculi, Urethritis, Urethral Diverticula.

Course Code	Course Title	Credit
PGDMU 1304	**Ultrasound of Superficial Structures**	**03**
Course Objectives	Ultrasound plays a very important role to evaluate normal and abnormal condition of superficial structures of the human body. This course covers the anatomy, physiology, pathology and sonographic techniques used in investigations of the neck, breast, scrotum, musculoskeletal studies and other superficial parts applications. Learners will learn to describe the anatomy and physiology of the thyroid, breast, scrotum and appendix and identify the normal and abnormal sonographic appearances of these structures, can competently perform sonographic examinations of the thyroid, breast and scrotum, can explain the significance of clinical tests relevant for these structures, can locate and critically assess further information relevant to the sonography of superficial structures.	
Textbook and References	i. WHO Manual of Diagnostic Ultrasound (2nd Edition) edited by Harald Lutz, Elisabetta Buscarini. ii. Diagnostic Ultrasound (4th Edition) by Carol M. Rumack MD FACR, Stephanie R. Wilson MD, J. William Charboneau MD, Deborah Levine MD iii. Abdomen and Superficial Structures (Diagnostic Medical Sonography Series) Third Edition by Diane Kawamura, Bridgette Lunsford iv. Lange Review Ultrasonography Examination (4th Edition) by Charles S. Odwin, Arthur C. Fleischer	

Course Contents:

1. **Thyroid Gland:** Examination Technique, Thyroid ultrasound, Abnormal thyroid, Focal Masses (Solid), Focal masses (Cystic), Calcification, Diffuse thyroid lesions..
2. **The Parathyroid Gland:** Anatomy, Sonographic Evaluation of the Parathyroid Gland, Primary Hyperparathyroidism, Secondary Hyperparathyroidism
3. **Breast:**
   a. **Female Breast:** Anatomically the breast layers, Vascular supply and lymphatic drainage, Breast ultrasound examination technique, Position of patient, Transducer/ Probe, Scanning Technique, 4 Quadrants examination includes, Sonographic Appearanceof breast, **Malignant disease:** Common Ca of breast tissue**, Benign Disease:** Fibrocystic Disease/ Changes.

b. **The Male Breast:** Some risk factors for male breast cancer, Breast cancer screening, Clinical signs and symptoms of possible breast cancer, Sonographic criteria of breast cancer.

4. **Testes and Scrotum:** Anatomy, The scrotum, Testis and epididymis, Indications for Testicular Ultrasound, Patient Preparation, Position of the patien, Choice of transducer, Sonographic Anatomy, The Normal Testis, Torsion of the Testes, Seminomas, Teratomas, Abscess, Hydrocele, Hematocele and pyocele, Varicocele.
5. **The Vermiform Appendix:** Size and location, Appendicitis, Rovsing's sign, Psoas sign, Obturator sign, Sonographic Signs of Appendicitis, Gangrenous Appendicitis, Perforated Appendicitis

Course Code	Course Title	Credit
PGDMU 2306	**Cross–Sectional Anatomy & Pathophysiology-II**	**03**
Course Objectives	Cross–Sectional Anatomy and Pathophysiology plays an important role to evaluate normal and abnormal structures of human body. In this module the learners will learn how to prepare for and perform an ultrasound examination of the abdomen, the interactive classes provides three different scan scenarios, including normal and pathological cases. It enables learners to build or refresh knowledge and cognitive skills, and offers a safe environment so learner can practice and prepare for the real clinical world.	
Textbook and References	i. WHO Manual of Diagnostic Ultrasound (2nd Edition) edited by Harald Lutz, Elisabetta Buscarini. ii. Diagnostic Ultrasound (4th Edition) by Carol M. Rumack MD FACR, Stephanie R. Wilson MD, J. William Charboneau MD, Deborah Levine MD iii. Examination Review for Ultrasound: Abdomen and Obstetrics & Gynecology (1st Edition) by Steven M. Penny M.A. RT (R) RDMS iv. Prep Manual for Medical Graduates (Medical Ultrasound) – 6th Edition by Dr. Md. Jahidur Rashid v. Textbook of Diagnostic Sonography (2-Volume Set) 7th Edition by Sandra L. Hagen-Ansert MS RDMS RDCS FASE FSDMS	

Course Contents:

A. FEMALE PELVIS

I. Pelvic Inflammatory Disease: Tubal Patency Testing, Ultrasonography Directed Procedures **Pelvis:** Pelvic Viscera, Uterus, Ovaries, Endometrium, Fallopian Tube.

II. Uterine Pathology: Abnormal Bleeding, Endometrial Hyperplasia, Endometrial Polyps, Carcinoma of the Endometrium, Endometritis, Uterine cavity fluid collections,The Uterine Fibroid, Fibroids and Pregnancy, Uterine Metastases, Uterine Adenomvosis, Nabothian Cysts, Cervical incompetence, Carcinoma of the Cervix .

III. Ovarian Pathology: Normal Appearances, Technique of Examination, Transabdominal Scanning, Transvaginal Scanning, Size and Morphology, Cyclical Variations, Position, Absence, Functional Cysts, Foillicular Cysts, Corpus Luteum Cyst, Polycystic Ovaries, Pelvic Inflammatory Diseases, Endometriosis.

IV. Screening for Ovarian and Uterine Cancers: Screening Principles, Possible Screening Techniques, Radio-immunoscintigraphy, Tumour Markers, Vaginal Examination, Transabdominal

Ultrasonography, Trans-vaginal Ultrasonography, Screening for Uterine Cancer.

V. Infertility: Technique and Equipment, Potential Dangers of Ultrasonography, Ovarian Ultrasonography, Ovarian Morphology, Ovarian Follicular Monitoring, Uterine Ultrasonography, Congenital Abnormalities, Tubal Ultrasonography, Normal Tube.

Course Code	Course Title	Credit
PGDMU 2407	**Obstetrics and Gynaecological Ultrasound**	**04**
Course Objectives	The course covers the ultrasound techniques in regard to gynaecology, including normal and pathological conditions of the uterus, ovaries and adnexa, and the ultrasound techniques currently applied to obstetrics throughout the three trimesters, including normal appearances, fetal abnormalities and complications of pregnancy. Obstetric sonography has become an indispensable tool during pregnancy. Learners will learn how to prepare for and perform an ultrasound examination during pregnancy. Can identify on diagrams and sonograms normal fetal anatomy of the second and third trimesters, can describe and demonstrate gestational age assessment in the second and third trimesters, including multiple pregnancies, fetal presentation and position, can identify on diagrams and sonograms normal feto-placental anatomy of the second and third trimesters, can compare and contrast the advantages of 3D/4D imaging with those of conventional 2D imaging, can follow relevant protocols when scanning, can define and use related medical terminology.	
Textbook and References	i. WHO Manual of Diagnostic Ultrasound (2nd Edition) edited by Harald Lutz, Elisabetta Buscarini. ii. Diagnostic Ultrasound (4th Edition) by Carol M. Rumack MD FACR, Stephanie R. Wilson MD, J. William Charboneau MD, Deborah Levine MD iii. Callen's Ultrasonography in Obstetrics and Gynecology (6th Edition) by Mary E Norton MD iv. Obstetrics & Gynecology (Diagnostic Medical Sonography Series) Third, Revised Reprint Edition by Susan Raatz Stephenson MA.Ed. BSRT-U RDMS RVT v. Examination Review for Ultrasound: Abdomen and Obstetrics & Gynecology (1st Edition) by Steven M. Penny M.A. RT (R) RDMS vi. Prep Manual for Medical Graduates (Medical Ultrasound) – 6th Edition by Dr. Md. Jahidur Rashid vii. Textbook of Diagnostic Sonography (2-Volume Set) 7th Edition by Sandra L. Hagen-Ansert MS RDMS RDCS FASE FSDMS	

Course Contents

PREGNANCY

I. The First Trimester Transabdominal Examinations: Ultrasonography Signs of Early Pregnancy, Measurements in the First Trimester, Gestation Sac, Crown-rump Length, The Placenta, Multiple Pregnancy Assessment of Abnormalities, Low Implantation, Inevitable Abortion, Blighted Ovum or Blighted Twin, Incomplete Abortion, Hydatidiform Mole, Ectopic Pregnancy, Tumours in Early Pregnancy.

II. The Normal Foetus: Head, Cranium and Cranial Contents, Skull, Intracranial Structures, The Shoulder and Pelvic Girdles, The Diaphragm The Abdomen The Liver, The Spleen, The Stomach, The Small Intestine, The Kidneys The Bladder, The Adrenal Glands, Fetal Genitalia, Amniotic Fluid, Multiple Pregnancies.

III. Establishing Gestational Age: Clinical Methods of Establishing Gestational Age, Evaluation of Ultrasonography Charts, Used to Determine Gestational Age, Gestation Sac Volume, Crown-rump Length, Biparietal Diameter, Head Circumference and Abdominal Circumference, Femur Length, Multiple Parameters, Choice of Measurements for Routine Examinations, Multiple, Pregnancy, The Evidence for Routine Ultrasonography ,Examination to Confirm or Establish Gestational Age.

VI. Foetal growth: Normal Intra-uterine Growth, Abnormal Intra-uterine Growth, Small for Dates, Methods of Growth Assessment, Biparietal Diameter, Head Circumference, Cerebellar Growth, Femur Length, Abdominal Circumference, Abdominal Measurements, Head Circumference, Amniotic Fluid Volume.

V. Placenta and Cord: Placental Development and Maturation, Placental localization, Placental Size, Major Structural Abnormalities of the Placenta Abnormalities of Placentation, Placenta multilobata and accessorylobes, Placental Vascular lesions, Placental Tumours, Major Structural Abnormalities of the Umbilical Cord, Cord Tumours.

FETAL ANOMALIES

I. The Central Nervous System: Neural tube defects, Anencephaly and exencephaly, Encephalocele, Spina bifida, Caudal regression syndrome ,Hydrocephalus, Holoprosencephaly, Agenesis of the corpus callosum, Hydranencephaly, Choroid plexus cysts, Arachnoidcysts, Posterior fossa abnormalities, Cerebellar abnormalities, Aneurysms of the internal cerebral veins.

II. The Urinary Tract: Normal urinary tract, Renal agenesis, Renal cystic disease, Renal dysplasia, Polycystic kidney disease, Dilatation of the urinary tract, Pelvi-ureteric junction obstruction, Ureterovesical junction obstruction, Bladder outflow obstruction, Renal tumours.

III. The Gastrointestinal Tract: Anterior abdominal wall defects Omphalocele, Gastroschisis, Intestinal obstructions, Oesophageal atresia, Duodenal obstruction, Choledochal cyst.

IV. The Heart: Normal fetal cardiac anatomy Technique, The four chamber view, Imaging the great arteries, Cardiac malformations.

V. The Skeleton : Patient selection for detailed skeletal survey, Aids to diagnosis of skeletal dysplasias, Skeletal malformations, Osteochondro dysplasias.

Introduction to TVS

- Normal and Abnormal Uterus
- Normal and Abnormal Ovaries
- Pelvic Infections
- Diseases of Post-Menopausal Women
- Normal and Abnormal Pregnancy
- Evaluation of Infertility and Folliculometry
- TVS Scanning Protocol and Reports

Course Code	Course Title	Credit
PGDMU 2308	**Neurosonology and Vascular Ultrasound**	**03**
Course Objectives	Learners will learn about description and explain the haemo dynamics, normal physiological and pathological factors that influence arterial and venous blood flow, details about the anatomy and physiology of the intra and extracranial arterial system, peripheral vascular systems, abdominal vascular system and identify the common clinical presentations and associated pathology, the ultrasound techniques used in the examination of carotids arteries, lower limb veins, aorta, renal, mesenteric and peripheral vascular studies, competently perform sonographic examinations of the carotid arteries and lower limb venous system to exclude Deep Venous Thrombosis, can demonstrate the applications of color flow and spectral Doppler imaging and explain how to optimize the images produced, can outline and explain the safety issues associated with color flow imaging and spectral Doppler. Identify the complexities of stenosis classification, can understand the role of Color Duplex/ABI in leg evaluation, can understand the applications of Color Duplex during pregnancy and in small parts scanning. Assess masses and be able to describe the Color Duplex features that characterise them, can explain the use of ultrasound contrast agents and discuss the direction of ultrasound development in the area of vascular ultrasound.	
Textbook and References	i) Clinical Doppler Ultrasound, 3rd Edition by Myron A. Pozniak& Paul L. Allan ii) Diagnostic Ultrasound (4th Edition) by Carol M. Rumack MD FACR, Stephanie R. Wilson MD, J. William Charboneau MD, Deborah Levine MD iii) Color Doppler, 3D and 4D Ultrasound in Gynecology, Infertility and Obstetrics (2nd Edition) by Sanja, M.D., Ph.D. Kupesic, Asim Kurjak iv) Neonatal Cranial Ultrasonography (1st Edition) by GerdaMeijler	

Course Contents

Neurosonology (Cranial Ultrasound): Indications for neonatal cranial ultrasound: Scanning technique, Coronalscan, Axialscan, Normal midline anatomy, Sagittal section, Coronal section, Axial section, Ventricular dilatation, Intracranial bleeding, Intraventricular bleeding into normal size ventricles, Intraventricular bleeding into dilated ventricles, Intraventricular bleeding, Sequelae of bleeding, Neonatal cerebral abnormalities

Vascular Ultra sound: Physics of Color Doppler, Physics of Power Doppler, Color Doppler of Carotid Artery, Jugular Vein, Vertebral Artery, Vascular Duplex of Upper Limb, Lower Limb, Color Doppler of Abdominal Vessels, Portal Venous Systems, Renal Artery Stenosis, Aorta and IVC,

Color Doppler of Superficial Organs, Thyroid, Breast, Penis and Scrotum, Color Doppler of Gynecological Disorders, Uterine Arteries, Ovarian Arteries, PCOD, Ovarian Torsion, Endometriosis, Ovarian Masses, Color Doppler of Obstetrical Disorders Uterine Arteries, Umbilical Artery, Middle Cerebral Artery, Other Fetal Vessels, Intrauterine Pregnancy (Normal and Abnormal), Ectopic Pregnancy, Doppler Scanning Protocol and Reports

Course Code	Course Title	Credit
PGDMU 2209	**Clinical Sessions in Ultrasonography and Other Diagnostic Imaging Modalities**	**02**
Course Objectives	Learners will learn about diagnostic medical sonographic procedures using appropriate medical and sonographic terminology, describe instrumentation and components of diagnostic ultrasound equipment and systems, explain the process of ultrasound image acquisition, discuss technological principles and physical concepts relevant to the practice of diagnostic medical sonography and evaluate sonographic images using knowledge of anatomy, pathology and ultrasound physics, radiation safety and risk management, protect and enhance patient/client safety, practice in diagnostic radiography, practice in nuclear medicine, explain the principles and clinical applications of ultrasound imaging and magnetic resonance (MR) imaging, explain the principles and clinical applications of ultrasound imaging and magnetic resonance (MR) imaging.	
Textbook and References	i) WHO Manual of Diagnostic Ultrasound (2nd Edition) edited by Harald Lutz, Elisabetta Buscarini. ii) Diagnostic Ultrasound (4th Edition) by Carol M. Rumack MD FACR, Stephanie R. Wilson MD, J. William Charboneau MD, Deborah Levine MD iii) Understanding Ultrasound Physics (4th Edition) by Sidney K Edelman iv) Clinical Radiology : The Essentials - 3rd edition by Richard H Daffner	

Course Contents

3D/4D Ultrasound: Definition, 3D Principle-Physical Basics, Volume Acquisition, (2) Image Reconstruction, Image Display, Multi-Planar Reformatting, Real-time 4D, Timing of 3D ultrasound, Sex determination, Visualization of the fetus, There are differences in the types of ultrasounds done in pregnancy, 3D/4D Clinical Application, 3D US in Obstetrics, Indications for 3D/4D ultrasound

Medical Echocardiography: Maternal Indications, Familial Indications, Normal Heart –2D Imaging, Cardiacposition, Fetal Heart, Cardiac Four Chamber View, Long Axis View, Short Axis View, M-Mode, Color Flow Imaging.