Sri Lakshmi Narayana Institute of Medical Sciences

Date: 04.11.2017

From

Dr.Jansi Rani
Professor and Head,
Department of Biochemistry,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: Basic concept of Auto analyzer of clinical biochemistry laboratory

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled: **Basic concept of Auto analyzer of clinical biochemistry laboratory** for interns May to June 2019. We solicit your kind permission for the same.

Kind Regards

Dr. Jansi Rani

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: Dr G. Jayalakshmi

The HOD: Dr. Jani Rani

The Expert: Dr. Kajalakehmy

The committee has discussed about the course and is approved.

Dean

Subject Expert

HOD

(Sign & Seal)   (Sign & Seal)   (Sign & Seal)

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.

[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

07.010.2018

Sub: Organising Value-added Course: Basic concepts of Auto analyzer in clinical biochemistry laboratory. reg

With reference to the above mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"Basic concepts of Auto analyzer in clinical biochemistry laboratory"**. The course content and registration form is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before Nov to Dec 2018. Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

DEAN
SRI LAKSHMI NARAYANA INSTITUTE OF MEDICAL SCIENCES
OSUDU, AGARAM VILLAGE,
KOODAPAKKAM POST,
PUDUCHERRY - 605 502

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

Basic concept of Auto analyzer of clinical biochemistry laboratory- BIO 09

2. Duration & Period

30 hrs &November and December 2018

3. Information Brochure and Course Content of Value Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment- closed

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

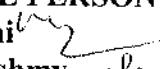1 time November and December 2019

8. Year of discontinuation: 2019

9. Summary report of each program year-wise

SI. No	Course Code	Course Name	Resource Persons	Target Students	Strength & Year
		Value Added Course- May –June 2018			
1	BIO-09	Basic concept of Auto analyzer of clinical biochemistry laboratory	Dr. Jansi Rani Dr.Kajalaksmy	MBBS Students	20 students MAY-JUNE 2018)

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON
1. Dr.Jansi Rani
2. Dr. Kajalakshmy

COORDINATOR
Dr.Jansi Rani
PROFESSOR & HOD
DEPARTMENT OF BIOCHEMISTRY
Sri Lakshmi Narayana Institute Of Medical Sciences
PONDICHERRY 605 502

Course Proposal

Course Title: **Basic concepts of auto analyzer in biochemical laboratory**

- **Course Objectives:**
- To learn about analyse the samples
- To reduce the analytical errors in clinical laboratory
- the use of **automation in clinical** laboratory enables to perform many tests by analytical instruments with minute use of an analyst

Course Outcome: To improve the quality of sample analysis and to reduce the analytical errors in clinical laboratory

Course Audience: MBBS students 2018 Batch

Course Coordinator: Dr.Jansi Rani

Course Faculties with Qualification and Designation:

1.Dr.Jansi Rani, Professor & HOD

2.Dr.Kajalakshmy, Assistant Professor

Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1.	12-11-2018	Introduction of autoanalyzer in clinical biochemistry laboratory	2-3p.m	1
2.	13.11.208	Parts of clinical auto analyzer	4-6p.m	2
3.	14.11.2018	a. Simpler b. Proportionating pump c. Dialyzer d. Constant temperature. e. Flow through colorimeter Recorder	4-6p.m	2
4.	15.11.2018	Basic approaches to automated autoanalyzer	4-6p.m	2

5.	16.11.2018	Basic concepts of autoanalyzer block diagram	4-6p.m	2
6.	17.11.2018	Photometry analyzer	4-6p.m	2
7.	18.11.2018	Photometric analyzer	4-6p.m	2
8.	19.11.2018	Kinetic or enzymatic measurement	4-6p.m	2
9.	20.11.2018	End point procedures	4-6p.m	2
10.	21.11.2018	Centrifugal analyzer	4-6p.m	2
11.	22.11.2018	Random access analyzer	4-6p.m	2
12.	23.11.2018	Reporting	4-6p.m	2
13.	24.11.2018	Applications	4-5p.m	1
14.	25.11.2018	ISE theory	4-6p.m	2
15.	26.11.2018	Safety Regulations	4-6p.m	2
16.	27.11.2018	Advantages and disadvantages of auto analyzer	4-6p.m	2
		Total		31hrs

REFERENCE BOOKS:

1. treitberg GS, Angel L, Sikaris KA, Bwititi PT. Automation in clinical biochemistry: core, peripheral, STAT, and specialist laboratories in Australia. J Lab Autom. 2012;17:387–94

2. Doumas BT. The evolution of clinical chemistry as reflected in textbooks

published in the United States. Clin Chem. 1998;44:2231–3.

3. Rosenfeld L. Clinical chemistry since 1800: growth and development. Clin Chem. 2002;48:186–97.

BASIC CONCEPTS OF AUTOANALYZER IN CLINICAL BIOCHEMISTRY LABORATORY

PARTICIPANT HAND BOOK

Annexure- I

BIHER   SLIMS

COURSE DETAILS

Particulars	Description
Course Title	Basic concepts of Auto analyzer in clinical biochemistry laboratory
Course Code	BIO04

Topics and content of the course in the Hand book	1. Introduction of autoanalyzer in clinical biochemistry laboratory
	2. Parts of clinical auto analyzer
	   a. Simpler
	   b. Proportionating pump
	   c. Dialyzer
	   d. Constant temperature.
	   e. Flow through colorimeter
	   f. Recorder
	3. Basic approaches to automated autoanalyzer
	4. Basic concepts of autoanalyzer block diagram
	5. Photometry analyzer
	6. Photometric analyzer
	7. Kinetic or enzymatic measurement
	8. End point procedures
	9. Applications
	10. ISE theory
	11. Safety Regulations
	   Advantages and disadvantages of auto analyzer

Advantages of learning and evaluation	• To learn about analyse the samples • To reduce the analytical errors in clinical laboratory the use of **automation** in **clinical** laboratory enables to

	perform many tests by analytical instruments with minute use of an analyst
Further learning Opportunities	Can be included in the university examination for 1st year MBS practical sections As a responsible for quality and improvement of clinical laboratory
Key Competencies	• The new curriculum focuses on competencies and outcomes. It gives a list of emphasis to skill development in all places To reduce the analytical errors in clinical laboratory
Target Student	MBBS students
Duration	30hours Nov to Dec 2018
Theory Session	30hours
Assessment Procedure	To assess the quality of sample analysis

INTRODUCTION:

Annexure- I

INTRODUCTION:

The word automation is inspired by word automatic. Automatic means exercising control without interference. So automation means getting work done by machines which can run on their own without our continuous monitoring. Automation refers to machines with intelligence and adaptability which reduces our workload and need for nonstop supervision.

AUTOMATION IN CLINICLA LABORATORY There are several individual steps in the analysis process as a whole in a laboratory such as: 1. Identifying the patient 2. Getting the correct sample 3. Identifying and proper labeling of the sample 4. Delivery of sample in proper storage condition and within time BIOCHEMISTRY MODULE Automation in Clinical Laboratory Biochemistry 322 Notes 5. Preparation of sample for test 6. Sample loading/aspirating 7. Analysis 8. Reporting 9. Entering in register Imagine if you are asked to add from no 1 to 100 and write the result throughout the day. How would you feel? Can you assure that after 2 hours of repeating the same task you will not be bored and make mistakes? But an automated machine will never feel tired nor make mistake as often as you will. Automation has a lot of benefits for the laboratory personnel. 1. Reduces the workload 2. Increases turnaround time (Saves time used per analysis) 3. Increases total number of tests done in less time 4. Eliminates repetition and monotony from human life so decreases human error, improves accuracy 5. Improves reproducibility (repeatability) 6. Uses minimum amount of sample and reagent In a clinical laboratory set up automation is useful in routine chemistry, hematology, immunological assay, and daily processing of large number of samples etc. Usefulness of automation in advanced and well equipped clinical laboratory can be also extended to 1. Transport of specimen 2. Processing of specimen 3.

Loading of specimen into auto analyzer 4. Assessment of results of performed tasks However, if above steps are not automated due to lack of finance and infrastructure, still any ordinary laboratory at least go for automation in its analysis step. The routine techniques and procedures that are done manually by technicians are replaced by automated analyzers called AUTOANALYZER.

Sample collection

The use of glucometer is one such example where just by pressing a button on finger tip, the finger is pricked with least pain and analysis is also done then and there. However, not all tests can be done in glucometer. So, automation in sample collection mainly refers to improved, faster and least discomfort causing techniques of collection. Such as: robotic system, vacutainers etc. Blood collected using a vacutainer. Here the phlebotomist need not pull the syringe, blood gets sucked in due to negative pressure filling the vaccum. Different types of vacutainer for serum collection and for plasma collection using different types of anticoagulants. The identification is done with the colour of caps used.

Sample identification by Labeling and bar coding

The laboratory information system comes into take part here. It first generates a unique identity or hospital number for each new patient. A record is maintained thereafter for him/her. All sample collected have to

bear the name and details of the patient along with this unique identity (hospital number). The same is used while entering the details into auto analyzer software and result is also published with this number and other details. Some advanced labs are using computer generated bar coding technology for labeling samples. It has the advantage that it can be scanned and read by bar code reader accurately so transcriptional error (mistake in writing manually) is avoided.

Sample delivery

Most of the laboratories rely on human pick up system or conveyer belt system. Though cheaper, it may lead to human error, delays etc. Pneumatic tube systems (use of pressurized gas to move the tubes containing samples) are used in some laboratories. However, care has to be taken that acceleration and deceleration should not damage any sample. In very advanced laboratory mobile robots are used.

Sample preparation

Most of the labs depend on technicians for sample processing (such as serum separation) as soon as sample arrives. However introduction of automation can reduce the workload on technicians and save their time and expertise for analysis purpose. Therefore, now days many semi automated devices are developed which can analyze whole blood itself. For example, automated ion selective electrode, use of dry chemistry etc. The automated sample processors come in 2 types: z Stand alone

automated sample processors and z Independent automated sample processors. These automated sample processors can do the following tasks: sorting of samples, removing caps, separating samples, bar coding etc. having an automated sample processor solves the task of bar coding and sample delivery via conveyer belt system.

SAMPLE ANALYSIS

Now let us study briefly about each aspect of automation in the analysis process itself which is the minimum essential aspect of automation for any laboratory. For automation in analysis process we have invented auto analyzer

TYPES OF AUTO ANALYZERS

Auto analyzers based on above principle can be divided into two types

1. Open system

2. Closed system

Open system

In this system, the operator has the advantage that he can purchase reagents from any company so he can save money by buying reagents which are cheaper thereby reducing the cost per test. In a modular design: An auto analyzer is designed by assembling pulling together of all parts. This increases the flexibility of machine according to customer's demand. For example: Ion selective electrode. Due to

modular approach, the facility for analysis of sodium, potassium and chloride can be built into the system or can be added later on.

Closed system

In this system the operator has to buy chemicals only from a particular company, because reagents from different companies will simply not be accepted by the machine, so machine will not run. So operator can not reduce the cost per test. Next, reagents have to be provided in unique containers or format as prescribed by its manufacturer. This too adds to cost per test. However, it allows high degree of automation. Laboratory can be managed by just one or two well trained technical assistants. The automated machines are designed to function as either a modular system or an integrated system.

Parts of Auto-analysers:

These instruments are involved in the automation to the routine biochemical analysis of hospital specimens. About 60 to 300 samples of blood or serum per hour for as many as 18 constituents can be analysed by the auto-analysers.

The principal parts of an auto-analyser are the followings:

Simpler.

ii. Proportionating pump.

iii. Dialyzer.

iv. Constant temperature.

v. Flow through colorimeter.

vi. Recorder.

i. Simpler:

(a) This module holds the batch of samples awaiting analysis in separate cups on a circular tray which is rotated at intervals.

(b) A probe connected by plastic tubing to the proportionating pump enters each sample serially.

(c) The volume of sample aspirated is determined by the pumping rate and the adjustable dwell time of the probe in the sample.

(d) As the probe movement into the sample cup was slow, the volume aspirated varied somewhat with the depth to which this was filled.

(e) The transit time between reservoir and sample is short.

ii. Proportionating Pump:

(a) This module determines the relative flow rates of sample and all reagents and replaces the use of different sizes of pipettes in manual methods.

(b) The pumping technique involves the peristaltic action produced by a series of rollers passing along an array of parallel plastic "Pump tubes".

(c) Each roller compresses all tubes so that the rate flow in each tube is proportional to the square of the pump tube diameter.

(d) Colour-coded tubes with a range of nominal diameters and pumping rates are available in three materials.

(e) The normal tygon tubing is suitable for most reagents but Acid-flex tubing is preferred for reagents containing corrosive acid and Salvaflex tubing for certain organic reagents.

iii. Dialyser:

(a) This module achieves the separation of small and large molecules by allowing the former to pass through a semipermeable membrane from the donor (sample) stream of liquid and air bubbles to a recipient , stream of liquid again segmented by air bubbles.

(b) The dialysis rate depends on the temperature but complete passage of small molecules into the recipient stream is rarely achieved and may be only a few percent of the total.

(c) The analytical process then requires that a constant fraction should dialyse and this is not always the case when simple aqueous and protein-containing solutions are compared.

(d) It is important to ensure that the two streams flow in the same direction.

(e) Care must be taken to ensure that the output from the recipient stream is the one which enters the remainder of the analytical system. If the sample stream is greatly diluted, the difference may not be seen easily.

iv. Constant Temperature:

(a) It is to maintain the reaction mixture at a constant temperature for a defined time to bring about the required chemical change under controlled conditions.

(b) The incubator bath consists of a glass delay coil mounted in a thermostatically controlled oil bath. This is sealed and stirred constantly.

(c) Most baths are set at 37°C or 95°C but some have adjustable thermo-regulators which allow operation up to 120°C or even higher.

v. Flow through colorimeter:

(a) The colorimeter is to measure the intensity of colour produced in the reaction and to provide a graphical display of change in colour with time.

(b) The use of double beam spectrophotometer is costly and is rarely justified by analytical requirements. The single beam colorimeters have insufficient stability to operate reliably over the long period required.

(c) The Auto-analyser MKI colorimeter combines double beam operation with interference filters to select the wavelength.

vi. Recorder:

The servo-potentiometer recorder is used to record the ratio of the response from the two detectors and these responses are proportional to the intensity of light reaching the detectors.

Functioning of Auto-analysers:

i. The flow of the analytical stream is directed through plastic tubing from one module to another.

ii. The samples are then loaded into the cup of the sampler and the channels of the proportionating pump aspirate them as well as dilute them.

iii. The serum samples are led through one of the dialyser unit.

iv. The pump introduces suitable reagents through the other side of the dialyser.

v The two streams run side by side being separated only by dialysing membrane.

vi. A portion of dialyzable constituents of serum passes across the membrane into the reagent stream.

vii. Further treatment like incubation at suitable temperature is given in the constant temperature bath.

viii. The intensity of the colour developed is measured in a colorimeter and recorded in the recorder.

ix. Suitable standards are treated in the same way.

Lately, multiple analysers have been introduced with multiple channels to estimate as many as 18 selected constituents including the non-dialyzable proteins, enzymes like alkaline phosphatase, triacylglycerol's and electrolytes. About 60 to 300 samples can be investigated per hour simultaneously for 18 parameters.

Auto-analysers have gained much popularity for routine biochemical analysis in clinical laboratories for their speed, flexibility of the

methodol... i...reased quantum of clinical biochemical analysis, easy operation, ...:uracy of results.

Disadvan... ...f Auto-analysers:

i. Prohibit... ...

ii. **"Carry-** ...rors.

iii. The us... ...ds of any complicated equipment.
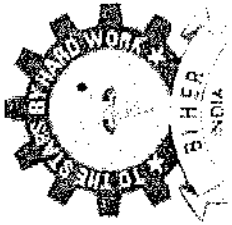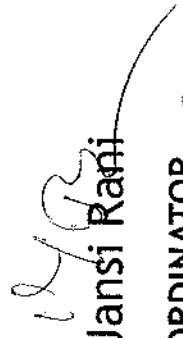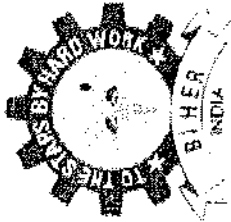
Sri Lakshmi Narayana Institute of Medical Sciences

CERTIFICATE OF MERIT

This is to certify that SUMAN KALYAN SAHOO has actively participated in the Value Added Course on Basic concepts of Auto analyzer in clinical biochemistry laboratory Nov – Dec 2018 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr. Rajalakshmy
RESOURCE PERSON

Dr. Jansi Rani
COORDINATOR HOD
PROFESSOR & BIOCHEMISTRY
DEPARTMENT OF BIOCHEMISTRY
Sri Lakshmi Narayana Institute of Medical Sciences
PONDICHERRY - 605 502

Sri Lakshmi Narayana Institute of Medical Sciences

CERTIFICATE OF MERIT

This is to certify that VIKAASH .M has actively participated in the Value Added

Course on **Basic concepts of Auto analyzer in clinical biochemistry laboratory** Nov

2018 – Dec 2018 Organized by Sri Lakshmi Narayana Institute of Medical Sciences,

Pondicherry- 605 502, India.

Dr. Rajalakshmy
RESOURCE PERSON

Dr. Jansi Rani
COORDINATOR
PROFESSOR & HOD
DEPARTMENT OF BIOCHEMISTRY

S.NO	Student Name	Reg.NO	Sign
1	TECHI NADAM	U18MB388	
2	ROHINI V	U18MB355	
3	SHEETAL SHRIVASTAVA	U18MB367	
4	SHRI KIRTI RAAJA	U18MB372	
5	VIKRANT SINGH	U18MB396	
6	PRAKRITI KAR	U18MB342	
7	IPSITA SETHY	U18MB303	
8	JAISHREE .S	U18MB306	
9	KEISHAM LUXMIRANI	U18MB315	
10	NABAM YAMIN	U18MB327	
11	NIDHI MADHUSOODANAN	U18MB332	
12	PRADEEP V S	U18MB340	
13	S.R.HEENA FEEMISHNEE	U18MB356	
14	SARFARAZ ISLAM	U18MB362	
15	SWAPNIL	U18MB384	
16	VARSHITHA .N	U18MB393	
17	VIKAS SHORAN	U18MB395	
18	YASHWANTH NAIK R	U18MB400	
19	SABARISH K S	U18MB357	
20	RACHEL SWARNA MARY B	U18MB346	

Course feedback form

Course title: Date :

Course code: BIO - 09

Department: Biochemistry

S.no	Design of the course	1	2	3	4	5
1	The objective of the course clear to you	/				
2	The course contents met with your expectations	/				
3	The lecture sequence were well planned		/			
4	The lectures were clear and easy to understand					
5	The audiovisual teaching aids were effectively used		/			
6	The instructor's encouraged interaction and was it helpful	/				
7	The contents were illustrated with examples		/			
8	Overall Rating of the course	/				

* Rating: 5 – Outstanding;   4 - Excellent;   3 – Good;   2– Satisfactory;   1 - Not-Satisfactory

Suggestions if any:

Excellent

Signature

Course feedback form

Course title: Date :

Course code: BIO - 09

Department: Biochemistry

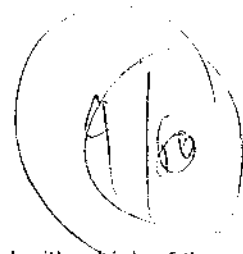| S.no	Design of the course	1	2	3	4	5
1	The objective of the course clear to you	✓				
2	The course contents met with your expectations		✓			
3	The lecture sequence were well planned	✓				
4	The lectures were clear and easy to understand		✓			
5	The audiovisual teaching aids were effectively used	✓				
6	The instructor's encouraged interaction and was it helpful		✓			
7	The contents were illustrated with examples	✓				
8	Overall Rating of the course	✓				

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Suggestions if any:

Signature

1. In mass spectrometer, the sample that has to be analysed is bombarded with which of the following?

   a) Protons

   b) Electrons

   c) Neutrons

   d) Alpha particles

2. In mass spectrometer, the ions are sorted out in which of the following ways?

   a) By accelerating them through electric field

   b) By accelerating them through magnetic field

   c) By accelerating them through electric and magnetic field

   d) By applying a high voltage

3. Which of the following statements is not true about mass spectrometry?

   a) Impurities of masses different from the one being analysed interferes with the result

   b) It has great sensitivity

   c) It is suitable for data storage

   d) It is suitable for library retrieval

4. In mass spectrometer, the sample gas is introduced into the highly evacuated spectrometer tube and it is ionised by electron beam.

   a) True

   b) False

5. Which of the following are electrochemical measurements

   a) Humidity and density

   b. Turbidity and differential vapor pressure

c. pH and ORP

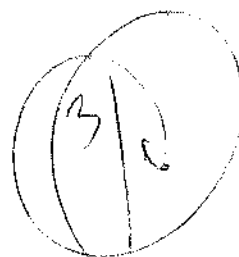d. Dew point and boiling point rise

6. Ion-selective measurements

a. Are similar to conductivity in operation but use a different cell

b. Are similar to capacitance measurement but use a different instrument

c. Are similar to pH measurement but use different electrodes

d. Are similar to density but use more exact techniques

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c. ✓ Are similar to pH measurement but use different electrodes

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From
Date: 09.01.2019

Dr. Jansi Rani

Professor and Head,
Department of Microbiology,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course:

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: **Basic concepts of auto analyzer of clinical Biochemistry.** We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr. Jansi Rani

Encl: Certificates

Photographs