Sri Lakshmi Narayana Institute of Medical Sciences

Date: 25.06.2019

From
Dr.Abarna.V
Department of Microbiology,
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: Certificate course in Stress management among medical students & Lab automation in clinical microbiology

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled **Certificate course in Stress management among medical students** July 2019 to October 2019 **& Lab automation in clinical microbiology from** November 2019 to March 2020 for undergraduates. We solicit your kind permission for the same.

Kind Regards

Dr.Abarna .V

Department of Microbiology

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: Dr.G.Jayalakshmi

The HOD: Dr.Abarna. V

The Expert: Mrs.Swathi.S

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & Seal)	(Sign & Seal)

Dr. G. JAYALAKSHMI, BSC.,MBBS.,DTCD.,M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Ageram Kudapakkam, Post,
Villanur Commune Puducherry-605 502.

DEPT OF MICROBIOLOGY
SRI LAKSHMI NARAYANA INSTITUTE OF
MEDICAL SCIENCES-PONDICHERRY 605 502

DEPT OF MICROBIOLOGY
SRI LAKSHMI NARAYANA INSTITUTE OF
MEDICAL SCIENCES-PONDICHERRY 605 502

Circular

30.10.2019

Sub: Organising Value-added Course: Certificate course in Lab Automation in Clinical microbiology

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 organising ". The course content "**Certificate course in Lab Automation in Clinical microbiology"** 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 1st 2019. Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

Dr. G. JAYALAKSHMI, BSC.,MBBS.,DTCD.,M.D
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Ageram Kudapakkam, Post,
Villanur Commune Puducherry-605 502

Encl: Copy of Course content form.

Course Proposal

Course Title: Certificate course in Lab Automation in Clinical microbiology

Course Objective:

1. Introduce the students to different fields of communication
2. To learn basic principles of automation
3. To learn the basic skills in automation

Course Outcome: Certificate course in Certificate course in Lab Automation in Clinical microbiology

Course Coordinator: Dr.abarna.V

Course Faculties with Qualification and Designation:

1. **Mrs.Swathi.S MSc, Tutor**
2. **Dr.Naveenkumar.C MSc;Phd, Assistant Professor**

Course Curriculum/Topics with schedule (Min of hours

Sln o	Date	Topic	Time	Hour	Lecture taken by
1.	6.11.2019	Definition of Lab Automation in Clinical microbiology	4-6p.m	2	Mrs.Swathi.S
2.	13.11.2019	Components of Automation	4-6p.m	2	Dr.Naveenkumar.C
3.	20.11.2019	Workflow	4-6p.m	2	Dr.Abarna.V
4.	27.11.2019	Classic system vs Automation	4-6p.m	2	Dr.Abarna.V
5.	4.12.2019	Software used in Lab automation	4-6p.m	2	Dr.Naveenkumar.C
6.	11.12.2019	Quick Tests for Species Identification 1	4-6p.m	2	Mrs.Swathi.S
7.	18.12.2019	Quick Tests for Species Identification 2	4-6p.m	2	Dr.Abarna.V
8.	8.1.2020	Hands On Training of 1,2	4-6p.m	2	Mrs.Swathi.S
9.	22.1.2020	Quick Tests for Susceptibility Testing 1	4-6p.m	2	Mrs.Swathi.S
10.	29.1.2020	Quick Tests for Susceptibility Testing 2	4-6p.m	2	Dr.Abarna.V
11.	5.2.2020	Hands on training of 1,2	4-6p.m	2	Mrs.Swathi.S
12.	19.2.2020	Effects of Laboratory Automation on Incubation Times of Agar Plates	4-6p.m	2	Dr.Abarna.V
13.	26.2.2020	Effects of Laboratory Automation on Quality	4-6p.m	2	Mrs.Swathi.S
14.	4.3.2020	Automated reading	4-6p.m	2	Dr.Abarna.V
15.	11.3.2020	LIS (Laboratory information system)1	4-6p.m	2	Dr.Naveenkumar.C
16	18.3.2020	LIS (Laboratory information system)2	4-6p.m	2	Mrs.Swathi.S

VALUE ADDED COURSE

1. Name of the programme & Code

Lab automation in clinical microbiology

2. Duration & Period

34hrs Nov 2019– March 2020

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:

Multiple choice questions- *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

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

34hrs Nov 2019– March 2020

8. Year of discontinuation: 2020

9. Summary report of each program year-wise

Value Added Courses (Nov 2019– March 2020)					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	MIC12	**Lab automation in clinical microbiology**	Mrs Swathi.S	MBBS	Nov 2019– March 2020

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON **COORDINATOR**

Lab Automation in Clinical microbiology

PARTICIPANT HAND BOOK

BIHER

SLIMS

Annexure1

COURSE DETAILS

Particulars	Description
Course Title	**Lab Automation in Clinical microbiology**
Course Code	MIC12
Objective	1. Definition of Lab Automation in Clinical microbiology 2. Components of Automation 3. Workflow 4. Classic system vs Automation 5. Software used in Lab automation 6. Quick Tests for Species IdentificationDepression 7. . Quick Tests for Susceptibility TestingCritical thinking 8. Effects of Laboratory Automation on Incubation Times of Agar Plates 9. Effects of Laboratory Automation on Quality 10.Automated reading 11.LIS (Laboratory information system)
Further learning opportunities	**Lab Automation in Clinical microbiology**
Key Competencies	On successful completion of the course the students will have an idea of Lab Automation in Clinical microbiology
Target Student	Ahs
Duration	32 hrs Nov 2019– March 2020
Date of discontinuation of course	2020
Theory Session	28hrs
Practical Session	6hrs
Assessment Procedure	Questionnaire

Lab Automation in Clinical microbiology

Date	Time	Topic	Resource person
6.11.2019	4-6pm	Definition of Lab Automation in Clinical microbiology	Mrs.Swathi.S
13.11.2019	4-6pm	Components of Automation	Dr.Naveenkumar.C
20.11.2019	4-6pm	Workflow	Dr.Jayalakshmi.G
27.11.2019	4-6pm	Classic system vs Automation	
4.12.2019	4-6pm	Software used in Lab automation	Dr.Naveenkumar.C
11.12.2019	4-6pm	Quick Tests for Species Identification 1	Mrs.Swathi.S
18.12.2019	4-6pm	Quick Tests for Species Identification 2	Dr.Jayalakshmi.G
8.1.2020	4-6pm	Hands On Training of 1,2	Mrs.Swathi.S
22.1.2020	4-6pm	Quick Tests for Susceptibility Testing 1	Mrs.Swathi.S
29.1.2020	4-6pm	Quick Tests for Susceptibility Testing 2	Dr.Jayalakshmi.G
5.2.2020	4-6pm	Hands on training of 1,2	Mrs.Swathi.S
19.2.2020	4-6pm	Effects of Laboratory Automation on Incubation Times of Agar Plates	Dr.Jayalakshmi.G
26.2.2020	4-6pm	Effects of Laboratory Automation on Quality	Mrs.Swathi.S
4.3.2020	4-6pm	Automated reading	Dr.Jayalakshmi.G
11.3.2020	4-6pm	LIS (Laboratory information system)1	Dr.Naveenkumar.C
18.3.2020	4-6pm	LIS (Laboratory information system)2	Mrs.Swathi.S

1. Defintion of Laboratory Automation in microbiology

"Automation is the technology by which a process or procedure is performed without human assistance

In the laboratory context this means that every switch from manual work to machines can be called automation. In this broad sense all machines in the laboratory are a kind of automation.

As a consequence the introduction of centrifuges into the laboratory routine decades ago had been a form of laboratory automation already. More intuitively acceptable is the term automation for machines executing longer workflows, for example blood culture analysis with continuous growth monitoring or automated minimal inhibitory concentration (MIC) determination.

However, in the current discussion among microbiologists the terms "laboratory automation" or "total lab automation" are normally used for the automation of the diagnostic workflow including all steps from inoculation to final result. Therefore a laboratory automation system has to process different specimen containers, agar plates, broths and slides. Specimens sent to a microbiology laboratory for bacterial culture have to be inoculated and incubated. Subsequently the culture results have to be evaluated, documented and, if need be, follow-up work initiated. Not included in this form of automation is the registration of specimens at the time of their arrival at the laboratory and the generation of a report for the clinician.

2. Components of Lab automation

Laboratory automation consists of two principal components. The first component is hardware and the second component is workflow. Adjusting existing workflows to the possibilities of the automation system is an essential step to fully tap the potential of the respective hardware.

A prerequisite for these adjustments is a flexible, well-structured and adequate control system for the hardware.

Focus of this review is the total lab automation of the classic bacterial culture and the main developments and progresses during the last three to four years. Besides some remarks on the different hardware systems it emphasizes possible and/or necessary workflow alterations in the context of

laboratory automation. It does not cover developments related to PCR or automation of culture of mycobacteria and fun

3. Workflow

A workflow is a repeatable pattern of activity. A pattern consists of a sequence of operations performed by a person, a machine or a combination of both [The term workflow can be used for short and for long sequences of operations. On one hand a workflow can be considered to be the basic organizational element within a laboratory. In this case the lifecycle of a patient sample in the microbiology laboratory can be described as a sequence of workflows. On the other hand, the term workflow is used to describe the whole process from arrival of a sample at the laboratory until the end of the diagnostic procedures.

- Lean

The term lean is a technical term from manufacturing. It arose from the Toyota Production System

- Time to Result

Time to result is the time necessary to generate, produce or receive data. It is the interval between

start and end of a workflow. This can be for example the time from ordering of follow-up work until

reading of the result.

A lean workflow aims at the shortest possible time to result.

- Time to Report

From the laboratory's point of view time to report is the time between arrival of the sample in the

laboratory and dispatch of the (final) report. From the clinician's point of view time to report is the

time between taking the patient sample until receipt of the report.

4. Classic System vs. Automation

The terms "classic system" and "classic workflow" are used for reference to the manual processes currently used in the majority of microbiology laboratories. In the classic system broths, slides and plates are inoculated manually, incubated in stand-alone incubators and read by looking at the actual plates.

The terms "automation" and "automated workflow" are used for reference to processes and workflows which use machinery for inoculation, incubation and imaging and thus have a much reduced manual hands-on time per sample.

However, it is not possible to strictly distinguish between classic and automated workflows because many intermediates with different levels of automation are theoretically possible or actually exist, e.g., due to the development of automated specimen processors. Workflows with a strong emphasis on manual work fall among the definition of "classic workflow". The term "manual workflow" is avoided on purpose because even in the automated workflow many steps have to be done manually.

- Total Lab Automation

The terms total lab automation or total laboratory automation (TLA) are used for reference to

systems which are capable of processing broths, slides and agar plates (media). These systems can

inoculate, incubate and image plates.

- What Is Quality?

To define the term quality for a microbiology laboratory the definitions from manufacturing and management can be consulted

Quality can be described as a measure of excellence and

uniformity. It can be provided by strictly following established standards to obtain results without significant variations. Quality can be implemented by defining standards and adhering to standards.

In process controls are used to monitor adherence to standards.

5. Software used in Lab automation

Looking at the available soft ware one can distinguish different levels of automation.Some automates are capable of inoculation only, some systems can inoculate and incubate. These two versions can be summarized under the term "partial automation". More elaborate systems are capable of inoculation (agar plates, broths and slides), incubation and imaging of agar plates. None of the systems can image slides or broths. These systems are the systems currently

providing the maximum version of automation. Companies try to market these systems as total laboratory automation

and throughout the review this term will be used to designate the most sophisticated systems.

However, in fact even these systems do not provide a "total automation". To fulfil the claim to be

a "total automation" and to fulfil the definition of automation mentioned above many developments

are essential (see paragraph: Wish list). Further information on the systems available can be found in two excellent reviews published in 2016 [12,13].

5. Workflow

The implementation of total lab automation entails auditing and review of longstanding routines.

Some assays, which are easy to perform in the classic system, are cumbersome and inconvenient to perform within an automated workflow.

6.. Quick Tests for Species Identification

In the classic system so called quick tests are performed directly on or from agar plates to guide follow-up work, e.g., catalase test, coagulase test, indole test, oxidase test or different latex agglutinationmtests. They are used to guide follow-up work, i.e., to decide whether further identification (ID) is necessary and which method is best suited for identification. Quick tests are performed directly and immediately when plates are read, that is when the technician holds the plate in her/his hand. In the automated system small tests are possible but time consuming because images are read not actual plates. To perform these tests plates would have to be called to the workstation and this would take time. In the meanwhile (until arrival of the plates) the technician would either have to wait patientl for the plate or continue reading and would have to go back to the specimen as soon as the plate is available. Both alternatives are incompatible with a lean workflow. Additionally, the time necessary to perform a quick test in an automated system is comparable to the time needed to perform a definitive ID. Therefore these tests will disappear in total lab automation and a definitive

ID will be performed in all cases. Since matrix assisted laser desorption ionization – time of flight mass spectrometry

MALDI-TOF MS has largely replaced biochemical identification and is still unrivaled in terms of

short time to result, low cost per determination and versatility and number of identifiable specie with a single workflow MALDI-TOF identification will replace the quick tests This necessary

workflow change will have a collateral benefit. All bacteria will be identified to the species level. Descriptive names for bacteria like "coagulase-negative staphylococci" will disappear

7. . Quick Tests for Susceptibility Testing

Other quick tests can give a hint on susceptibility of bacteria, e.g., PBP2a (penicillin binding protein 2a) agglutination tests for a quick determination of susceptibility of staphylococci towards methicillin. These quick tests can be easily performed during classic reading but are not convenient to perform in an automated workflow for the reasons mentioned above. In the classic system these quick tests are used to determine whether further antimicrobial susceptibility testing (AST) is necessary, i.e., they are used to reduce more laborious and more expensive susceptibility tests (agar diffusion, MIC determination). However, in a certain number of cases two tests have to be performed. In an automated workflow it is easier to perform a definitive susceptibility test (agar diffusion, MIC determination) immediately and thus to avoid double testing and additional hands on time. This will increase the amount of definitive susceptibility tests. The main collateral benefit of only using definitive susceptibility tests is an increase in quality. A certain percentage of all quick test results are either false positive or false negative. These errors are avoided by the described approach.

Agardilution—Susceptibility Testing

Agar plates for agar dilution assays are supplemented with a defined amount of antibiotic.

Because these agar dilution plates are quite expensive (compared to agar plates without supplement)

laboratories tend to use one plate for testing multiple strains. This can easily be done during classic

reading and follow-up work. Plates are manually labeled and depending on the skill of the technician

up to eight or even more different strains can be tested on a single plate. From a quality perspective,

experts have demanded for some time already that only one strain is tested per plate. There is a risk of

confusion of samples and strains during follow-up work and reading of plates if multiple strains are

tested per plate. However, in the laboratory routine applying multiple strains to one plate is still quite

common. In the automated system testing of multiple strains on one plate is not feasible. Each plate

has a unique identifier which steers the plate through the system. As soon as a plate is imaged this

image is added to one sample/specimen/case in the database.

8.. Effects of Laboratory Automation on Incubation Times of Agar Plates

The classic system works with incubation times measured in days. This has historical and organizational reasons. Plates are inoculated on day 0 and read once each following day until the end of the defined absolute incubation time, for example for 2 days. It is not feasible to document individual inoculation times of individual plates in the classic system. With laboratory automation plates are fully tracked as long as they stay within the system. Therefore incubation times can, and must be defined by the hour and minute. However, data on minimum and maximum incubation times are scarce. Laboratory staff normally adheres to the recommended incubation times mentioned in the package insert of the respective plate. These recommendations are normally based on data generated by the manufacturer and these data are mainly confidential and not publicly available. From an organizational point of view two principal types of incubation time exist: (A) the incubation time after which plates are read for the first time, and (B) the incubation time after which plates

are read for the last time. Choice of time of first read is dependent on the intended follow-up work. Choice of time of last read is dependent on the confidence level of a negative result. The longer the expected pathogens need for reliable growth the longer the incubation time has to be chosen. And the slowest pathogen sets the pace. To choose time points A and B optimally we need data on growth kinetics of bacterial species.

With total lab automation the generation of these kinetics is possible for the first time because plates can be imaged after individually chosen intervals of time, for example every two hours.

Looking at the results of bacterial growth kinetics three different time points can be determined: (A) first growth, that is the time point when the first bacterial mass is visible; (B) single colonies, that is the time point when the size and morphology of the colonies allow to distinguish between morphologies and allow follow-up work (species identification, susceptibility testing); and (C) typical growth, that is the time point when the morphology of the growing colonies is characteristic for a bacterial species; this time point can mainly be determined on chromogenic media and it is the color of the colony which is the decisive parameter.

- Incubation Times of Chromogenic Plates

Data on incubation times for growth of methicillin-resistant Staphylococcus aureus (MRSA), certain multi-drug resistant gram-negative bacteria (MDRGN) and vancomycin-resistant enterococci (VRE) on selective chromogenic plates were recently published (Burckhardt, Ann Lab Med 2019). Appearance of first growth was dependent on type and manufacturer of agar plate, bacterial species, bacterial strain and amount of bacteria inoculated. The more bacteria that were inoculated the earlier growth was detected.

First growth was visible as early as four hours after inoculation. However the bacterial mass available on the agar plate at first growth was not sufficient for follow-up work. Additionally different morphologies due to bacterial mixtures could not be distinguished. Single colonies appeared later and their appearance was dependent on the same parameters as the appearance of first growth, which is agar, species, strain and inoculum. In case the plates used were not only selective but also chromogenic a third time point was defined, that is the time point of typical growth. For MRSA this was between 14 and 22 h, for VRE this was between 12 and 48 h. Moreno-Camacho and co-workers showed in their

report, that growth of Escherichia coli,P. aeruginosa,E. faecalis and S. aureus on chromogenic plates was three to four hours faster in the automated system than in their classic system .

- Incubation Times of Agar Diffusion Plates

Incubation time for agar diffusion plates for susceptibility testing traditionally was

Klebsiella pneumonia,Staphylococcus aureus and Staphylococcus epidermidis. Their experiments with

E. coli ATCC 25922, S. aureus ATCC 29213 and more than 100 clinical isolates of each species reveale

9. . **Effects of Laboratory Automation on Special Sample Types**

- Effects on Blood Culture

De Socio and co-workers evaluated the effect of an automated workflow on the time to report for mono-microbial positive blood cultures In their setting the time to report was reduced by 24 h

and the duration of empirical therapy (in contrast to evidence/AST-based therapy) was reduced b The 30-day crude mortality rate was reduced by 12%.

- Effects on Urines

Urine is a sample type which is easy to process with an automated workflow. The container

for urines is simple, the sample itself is liquid, the sample can readily be acquired from the

patient in sufficient amounts and for microbiological work-up only few agar plates are necessary.

Additionally chromogenic media are available which ease the reading process.

As soon as urines were processed with total lab automation two effects were observed.

First, the detection rate of all bacteria and especially of fastidious species rose. This effect

was most pronounced for Alloscardovia omnicolens,Actinotignum schaalii,Gardnerella vaginalis and

Neisseria gonorrhoeae among others [32,33].

Second, the observed times to report were reduced. Klein and co-workers automated a classic workflow where only a single read on day one was common practice in a laboratory staffed 12/7.They observed a reduced time to report of 1.5 h. Theparee and co-workers transformed their classic workflow from first read after a minimum incubation time of 14 h to reading automated images after 12 h of incubation and observed a reduction of time to report of preliminary negative results, ID and

The effects on the time to report for urines and blood cultures were already described above.

10. Effects of Laboratory Automation on Quality

Quality of work will increase if machines are used for inoculation. Machines perform their tasks

in a steady and consistent fashion impossible for humans to achieve. Samples are always shaken

in the same way; the streaking pattern of a machine is always identical and is neither influenced

by inter- or intra-operator/technician variability. Several studies described the generation of more

single colonies [21,38,40] which reduced the number of subcultures for necessary follow-up work

(mainly for MIC determination).

Additionally plates are imaged reliably after a defined incubation time, thus reducing variabilityin colony aspect and size due to differences in incubation time. Reading of plates should be morecomparable and this is an important prerequisite for automated reading (see below).

The phenomenon of higher detection rates of fastidious organisms was already mentioned above. Samples which show no-growth in the classic system but show growth of pathogens in the automated system have to be considered false-negative in the classic system. Most probably the very standardized and constant incubation conditions support the growth of fastidious bacteria.

Culturing, identifying and testing bacteria is the prerequisite for an accurate and evidence-based antibiotic therapy. Therefore the higher recovery rate is an improvement of quality.

11. Automated Reading

Automated reading was evaluated for chromogenic plates (MRSA [

The sites worked with three different chromogenic media and images were taken immediately after manual reading, i.e., after 16–24 h after start of incubation. The authors found an overall sensitivity of 100% and an overall specificity of 90% [

41]. The study on VRE analyzed more than 100,000 VRE plates at three different study sites. The sites worked with 2 different plates and images were taken after 24 h or 40 h. The authors found an overall sensitivity of 100% for VRE detection and a negative predictive value of 100% for automated reading. For reporting purposes this is extremely important because with these data at hand automated reporting of negative reports can be done without further human assistance. However, data on specificity and the positive predictive value were suboptimal with

89% and 38% respectively Glasson and co-workers evaluated automated and classical reading of almost 10,000 urines processed at three different sites and found a sensitivity of 99% and a specificity

of 85% for blood and MacConkey agar. For quantification the agreement was 92% [43

12. LIS

In general microbiology laboratories already work with a computerized laboratory information system. Its function is to enable administration of patient samples, documentation of arrival and processing of samples and follow-up work. It is used to create lab reports. During the implementation of a TLA the

lab manager has to decide whether the LIS remains the master or becomes the slave of the TLA operating system. The decision is essential. A switch during work is not possible.

The currently available systems automate parts of the lifecycle of a patient sample for microbiologic diagnosis. To further improve the systems, to further reduce manual work and to reach the goal of "total automation" the manual parts of the microbiological workflow have to be automated.

Two different kinds of manual work/tasks can be discerned: (A) tasks within the current automated workflow, and (B) tasks before or after or adjacent to the current automated workflow.

Tasks within the current automated workflow which are still done manually are many and varied,

as follows:

(a) filling up the machine with consumables;

(b) sorting of sample containers in specialized racks;

(c) loading and unloading of racks into the specimen processor;

(d) follow-up work (that is identification, susceptibility testing, subculture);

(e) reading of plates;

(f) Generating reports for the clinicians;

(g) waste management;

Tasks before or after the currently automated workflow are many and varied, too, including:

(a) sample registration in the laboratory;

(b) incubation, assessment and documentation of broths;

(c)staining, assessment and documentation of slides;

(d) incubation and further processing of anaerobes and microaerophilic bacteria;

7.2. Which Data Is Needed for Optimization of Automation?

References

1.Groover, P.M. Fundamentals of Modern Manufacturing: Material, Processes and Systems, 4th ed.; John Wiley & Sons Inc.:

Hoboken, NJ, USA, 2010.

2.Wikipedia. Workflow. Available online: https://en.wikipedia.org/wiki/Workflow (accessed on 12 September 2018).

3.Womack, J.P.; Jones, D.T.; Roos, D. The Machine that Changed the World; Free Press: New York, NY, USA, 1990.

Annexure- II

VALUE ADDED COURSE

Certificate course in Lab Automation in Microbiology

MIC12

List of Students Enrolled Nov 2019 – March- 2020

List of MBBS Student			
Sl. No	**Name of the Student**	**Roll No**	**Signature**
1	AAYESHA TAUHEED	U19MB251	
2	ABHIJITH A	U19MB252	
3	ABIHA SHERIN M	U19MB253	
4	ABINAYA SHANMUGAM	U19MB254	
5	ADHITI PRAKASH	U19MB255	
6	ADITHYA S KUMAR	U19MB256	
7	S M AISHMEKA SAIRA	U19MB257	
8	AISHU MUPPANENI	U19MB258	
9	AJETH R	U19MB259	
10	AKASH P	U19MB260	
11	AMIR FAJURA A	U19MB261	
12	AMLAN KUMAR KAR	U19MB262	
13	ANANDHA VIGNESHVAR A	U19MB263	
14	ANISHA C	U19MB264	
15	ANMOL KAUL	U19MB265	
16	ANNET GERIZIM	U19MB266	
17	ANUSHA MOL VINCENT VJP	U19MB267	
18	ARAVIND N	U19MB268	
19	ARNAB ADHIKARI	U19MB269	
20	ARNAB JYOTI DAS	U19MB270	

RESOURCE PERSON

COORDINATOR

Sl. No	Name of the Student	Roll No	Signature
1	ARTHY M	U19MB271	
2	ARUNESHWARAN N	U19MB272	
3	ARUSHI MAHINDRA GAIKWAD	U19MB273	
4	ASHA J	U19MB274	
5	ASHMI RAHIMAN	U19MB275	
6	ATHULYA RAVINDRAN	U19MB276	
7	BALAJI M	U19MB277	
8	BALAJI S	U19MB278	
9	BAVINENI RAMYA SAI SREE	U19MB279	
10	BHUVAN SUNDAR M	U19MB280	
11	BIPIN HARIKUMAR	U19MB281	
12	BOOPATHISHANKAR K	U19MB282	
13	CAMILUS D	U19MB283	
14	CELINA OKRAM	U19MB284	
15	CHALLA SINDHOOR	U19MB285	
16	CHATE RUTUJA BHALCHANDRA	U19MB286	
17	DHARSHANA G	U19MB287	
18	K DHARSHNI	U19MB288	
19	DHIR ASUTOSH ASHIM	U19MB289	
20	EZHILMARAN R	U19MB290	

RESOURCE PERSON

COORDINATOR

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Lab automation in clinical microbiology

Apath

Course Code: MIC12

I. ANSWER THE QUESTIONS:

1. What are the various methods of Lab automation ?

- Bactec culture
-

2. What is LIS ?

laboratory information system

3. What are the quality control used in lab automation?

- tape.

4. What are the quick test for species identification ?

- Vitek

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Lab automation in clinical microbiology

Course Code: MIC12

I. ANSWER THE QUESTIONS:

1. What are the various methods of Lab automation ?

- Lab automation method

2. What is LIS ?

Lab information system

3. What are the quality control used in lab automation?

-

4. What are the quick test for species identification ?

Bacte

AnnexureIV

Student Feedback Form

Course Name: **Lab automation in Clinical Microbiology**
Subject Code: **MIC12**

Name of Student: Ajeeth Roll No.: U19MB259

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Sl. NO	Particulars	1	2	3	4	5
1	Objective of the course is clear			✓		
2	Course contents met with your expectations				✓	
3	Lecturer sequence was well planned				✓	
4	Lectures were clear and easy to understand			✓		
5	Teaching aids were effective			✓		
6	Instructors encourage interaction and were helpful			✓		
7	The level of the course				✓	
8	Overall rating of the course	1	2	3	4	5

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

Suggestions if any:

Date: 18/3/2020

Ajeeth
Signature

AnnexureIV

Student Feedback Form

Course Name: **Lab automation in Clinical Microbiology**
Subject Code: **MIC12**

Name of Student: Anmol Kaul Roll No.: U19MB265

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Sl. NO	Particulars	1	2	3	4	5
1	Objective of the course is clear					
2	Course contents met with your expectations		✓	✓		
3	Lecturer sequence was well planned					
4	Lectures were clear and easy to understand			✓		
5	Teaching aids were effective		✓			
6	Instructors encourage interaction and were helpful			✓	✓	
7	The level of the course					
8	Overall rating of the course	1	2	3	4	5

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

Suggestions if any:

Signature

Date: 18/2/2020

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that AJITH has actively participated in the Value Added Course on **Lab Automation In Clinical Microbiology** held during Nov 2019 – March 2020 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Mrs.Swathi.S
RESOURCE PERSON

Dr. Abarna.V
COORDINATOR

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that AANMOL KAUL has actively participated in the Value Added Course on **Lab Automation In Clinical Microbiology** held during Nov 2019 – March 2020 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Mrs.Swathi.S
RESOURCE PERSON

Dr. Abarna.V
COORDINATOR

Date : 18.3.2020

From
Mrs.Swathi.S,
The Department of Microbiology,
Sri Lakshmi NarayanaInstitute 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 Certificate course in Lab Automation in Clinical microbiology reg

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled**: Certificate course in Lab Automation in Clinical microbiology** from November to March 2020 for 40 students. 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,
S.Swathi

The Head Department of Microbiology

Encl: Certificates

Photographs