ರಾಜೀವ್ ಗಾಂಧಿ ಆರೋಗ್ಯ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕರ್ನಾಟಕ

Rajiv Gandhi University of Health Sciences, Karnataka

4th T Block, Jayanagar, Bengaluru 560041.

registrar@rguhs.ac.in , +91-80-29601928

No. RGUHSB/DCD/CU/AHS/2026/BMLS **Date: 27.10.2026**

NOTIFICATION

Sub: Implementation of the National Commission for Allied and Healthcare Professions (NCAHP) norms, regulations and competency-based curriculum framework for **Bachelor of Medical Laboratory Sciences (BMLS)** with effect from the Academic Year 2026–2027 – Reg.

Ref: 1.NCAHP Guidelines/Curriculum dated 24.04.2025.
2.Board of Studies AHS meeting held on 27.07.2026.
3.Committee of Academic Council (CAC) meeting held on13.08.2026.
4.217th Special Meeting of the Syndicate held on 20.08.2026.

*****

The (NCAHP) has issued the norms, regulations and competency-based curriculum framework for **Bachelor of Medical Laboratory Sciences (BMLS)** vide guidelines dated 24.04.2025(Ref.1). In accordance with the NCAHP framework, the Board of Studies Allied Health Sciences, (Ref.2) and CAC (Ref.3), recommended the adoption of the revised curriculum and related requirements for the BMLS course. The 217th Special Meeting of the Syndicate held on 20.08.2026 (Ref.4) has approved the same.

In exercise of the powers conferred under Section 35(1) of the Rajiv Gandhi University of Health Sciences Act, 1994, as amended from time to time, and pursuant to the approval of the 217th Special Meeting of the Syndicate held on 20.08.2026, the implementation of NCAHP-prescribed norms, regulations and competency-based curriculum framework for the **Bachelor of Medical Laboratory Sciences (BMLS)** course is hereby notified.

The provisions relating to the curriculum, course structure, internship, infrastructure and other academic requirements of the **Bachelor of Medical Laboratory Sciences (BMLS)** course shall be implemented in accordance with the NCAHP framework attached with this notification

This Notification shall be applicable to all affiliated Allied Health Sciences Colleges of the University offering the **Bachelor of Medical Laboratory Sciences (BMLS)** course, with effect from the Academic Year 2026–2027.

(Approved by Hon'ble Vice-Chancellor
in e-Office file No. E-155552/153038)

REGISTRAR

To,
The Principals of all affiliated Allied Health Sciences Colleges of RGUHS.

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Copy to:

1. The Special Secretary to Governor, Lok Bhavan, Bengaluru -560001.
2. Private Secretary to Minister for Medical Education & Skill Development, Room, No.206-207, Vikas Soudha, Dr. B.R Ambedkar Veedhi, Bengaluru
3. Additional Chief Secretary to Government, HFW (Medical Education), M S Building, 4th Gate, 6th Floor, Dr. B.R Ambedkar Veedhi, Bengaluru-01.
4. All the Members of Authorities of RGUHS.
5. PA to Vice-Chancellor/Registrar/Registrar (Eva)/FO, RGUHS, Bengaluru. 6. All the Section Heads, RGUHS, Bengaluru.
6. System Analyst – To host on RGUHS Website
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BACHELOR OF MEDICAL LABORATORY SCIENCE

BMLS

Curriculum and Syllabus

First Year to Third Year (Semesters I to VI) and
One-Year Internship (Semesters VII and VIII)
Competency-based, outcome-mapped and aligned to the NCAHP Competency Based Curriculum for Medical Laboratory Sciences (Approved Syllabus 2025) and the KSAHC framework

Rajiv Gandhi University of Health Sciences, Karnataka
Approved Curriculum | Academic Year 2026-27 | 4125 Hours | 160 Credits

Published by: Sri Arjun S Odeyar ,
Registrar, RGUHS

Compiled by: Dr Amrut S Kadam,
Director, Department of Curriculum Development, RGUHS

Prepared by: Dr Sai Kumar, Dean AHS, Dr Nethra S S , Chairman Board of Studies, AHS (UG) & Dr Shruthi H P Chairman Board of Studies, AHS (PG).

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Rajiv Gandhi University of Health Sciences, Karnataka

The Emblem

The Emblem of the Rajiv Gandhi University of Health Sciences is a symbolic expression of the confluence of both Eastern and Western Health Sciences. A central wand with entwined snakes symbolizes the Greek and Roman Gods of Health, Hermes and Mercury, and is adapted as the symbol of modern medical science. The pot above depicts the Amrutha Kalasham of Dhanvanthri, the father of all Health Sciences. The wings above it depict the human soul called Hamsa (Swan) in Indian philosophy. The rising sun at the top symbolizes knowledge and enlightenment. The two twigs of leaves in Western philosophy symbolize olive branches, an expression of peace, love and harmony. In Hindu philosophy, they depict the Vanaspathi (also called Oushadi) held in the hands of Dhanvanthri, which is the source of all medicines. The lamp at the bottom depicts human energy (Kundalini). The script “Devahitham Yadayahu” inside the lamp is taken from the Upanishad Shanthi Manthram (Bhadram Karnebhi Shrunuyama Devah…), meaning, “May we live the full span of our lives allotted by God in perfect health,” which is the motto of the Rajiv Gandhi University of Health Sciences.

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Rajiv Gandhi University of Health Sciences, Karnataka

Vision Statement

The Rajiv Gandhi University of Health Sciences, Karnataka, aims at bringing about a confluence of both Eastern and Western Health Sciences to enable humankind to "Live the full span of our lives allotted by God in Perfect Health."

It would strive for achievement of academic excellence by educating and training health professionals who:

- Shall recognize the health needs of the community.
- Shall carry out professional obligations ethically and equitably and in keeping with the National Health Policy.

It would promote development of scientific temper and Health Sciences research.

It would encourage inculcation of social accountability amongst students, teachers and institutions.

It would support quality assurance for all its educational programmes.

Motto

"Right for Rightful Health Sciences Education"

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Source Basis and Consolidation Status

- National Commission for Allied and Healthcare Professions Act, 2021.
- NCAHP Competency Based Curriculum for Medical Laboratory Sciences, Approved Syllabus 2025, Ministry of Health and Family Welfare.
- NCAHP Minimum Standard Requirements and Chapter 3 provisions on scope of practice, entry requirements, course duration, infrastructure and faculty for Medical Laboratory Sciences.
- KSAHC Allied and Healthcare Education Regulations - 2026.
- KSAHC Minimum Standard Requirements for Allied and Healthcare Institutions - 2026.
- Existing RGUHS B.Sc. Medical Laboratory Technology curriculum and syllabus, used to identify relevant additional content not duplicating the NCAHP curriculum.
- ISO 15189 and NABL requirements for medical laboratories, and the Biomedical Waste Management Rules, 2016, as amended, to the extent referenced in the curriculum.

Consolidation principle: The NCAHP Approved Syllabus 2025 and any subsequent NCAHP corrigendum prevail over earlier text. Editorial normalization, coding and RGUHS implementation language do not dilute the NCAHP core or displace powers reserved to NCAHP or KSAHC.

Approval and implementation status: Following consideration and approval by the RGUHS Board of Studies (Allied and Health Sciences) and the Department of Curriculum Development, this curriculum and syllabus is issued for implementation by RGUHS-affiliated institutions from the Academic Year 2026-27, subject to applicable University notifications, ordinances and examination regulations from time to time

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5. Regulatory and Academic Authority Framework

Authority	Functions retained in this document
NCAHP (Commission)	National standards, prescribed core competencies, nationally controlled entry or professional requirements, and matters expressly reserved to the Commission under the NCAHP Act and its notifications.
KSAHC (Council / State Council)	State regulatory adoption, clarification and implementation; institutional regulatory permission and recognition; inspections and compliance; professional, provisional and permanent registration; and approval functions assigned to the State Council.
RGUHS (University)	Affiliation and continuation of affiliation; curriculum organization; academic calendar; Board of Studies decisions where options are expressly permitted; teaching-learning plans; internal-assessment framework; conduct of University examinations; valuation, results, transcripts and award of degree.
Affiliated institutions	Delivery of the approved curriculum; maintenance of MSR; internal, practical and clinical-laboratory assessment; documentation; student support; internship training; and compliance reporting to RGUHS and the competent regulatory authorities.

Interpretation rule: Nothing in this RGUHS document shall be construed as transferring to the University any statutory power reserved to NCAHP or KSAHC. University implementation provisions operate only within the jurisdiction of RGUHS.

Document Scope and Use

This consolidated document covers the complete four-year Bachelor of Medical Laboratory Science programme: Semesters I to VI of classroom and laboratory instruction and the one-year internship comprising Semesters VII and VIII. It presents the complete RGUHS curriculum and syllabus as one continuous document for implementation by RGUHS-affiliated institutions. The NCAHP core is preserved in substance and the KSAHC implementation framework is followed. Common programme information is stated once at the beginning. Semester-wise course structures, course outcomes, content, teaching-learning methods, assessment methods and mappings follow sequentially. The RGUHS course-specific requirements and editorial

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mappings incorporated in this document form part of the approved curriculum.

Continuity principle: Programme outcomes, programme-specific outcomes and professional competencies apply across all six taught semesters and the internship at progressively higher levels of complexity, supervision and independence. They are therefore not repeated in each semester.

Outcome Architecture and Editorial Policy

The outcome hierarchy used in this RGUHS document follows the sequence: programme aim and graduate profile → programme outcomes and programme-specific outcomes → professional competency statements → course outcomes → unit and content outcomes → teaching-learning and assessment alignment.

Editorial and implementation policy: NCAHP outcomes and competencies are preserved in substance. Grammar has been normalized, overlapping statements organized and codes assigned for implementation. Where the NCAHP source did not prescribe a unit distribution or where prescribed unit hours did not aggregate to the prescribed contact hours, RGUHS has reconciled the distribution without altering the prescribed credits, contact hours or core content. Additional RGUHS course-specific requirements incorporated after consideration by the Board of Studies and the Department of Curriculum Development form part of this approved curriculum.

Programmes Aim and Graduate Profile

The Bachelor of Medical Laboratory Science programme shall prepare a competent, ethical, safety-conscious and evidence-informed medical laboratory professional capable of performing, verifying and reporting the full range of routine and specialised diagnostic investigations within lawful scope, participating effectively in inter-professional care, contributing to laboratory quality management and public health, and pursuing continuing education, scholarship and higher qualification.

The graduate is expected to practise across the total testing process from specimen collection to result interpretation and reporting; operate and maintain manual, semi-automated and automated platforms; apply quality control, biosafety and accreditation requirements; adapt to innovation,

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automation and molecular technology; and function in hospital laboratories, blood centres, reference and research laboratories, public-health laboratories, diagnostic industry, education and entrepreneurship.

Programme Outcomes

Code	Programme outcome
PO1	Apply scientific knowledge of the basic, biomedical and laboratory sciences in professional healthcare practice.
PO2	Demonstrate clinical and technical laboratory skills to deliver accurate, timely and quality diagnostic services.
PO3	Collaborate effectively within interdisciplinary healthcare teams to improve individual and societal health.
PO4	Uphold ethical values and professionalism within the legal framework of society and of laboratory practice.
PO5	Communicate effectively with healthcare teams, patients, donors and the community.
PO6	Practise evidence-based laboratory medicine to ensure high-quality professional performance.
PO7	Engage in continuous learning and adapt to technological advancement for professional growth.
PO8	Exhibit entrepreneurial, leadership and mentorship skills for independent practice and collaborative work in healthcare.
PO9	Demonstrate appropriate use of information and communication technology relevant to medical laboratory science.
PO10	Take responsibility for personal and professional development and maintain competency by applying newly acquired knowledge and abilities to patient care.

Programme-Specific Outcomes

Code	Programme-specific outcome
PSO1	Proficiently perform a full range of clinical laboratory tests, develop and evaluate test systems and interpretive algorithms, and work on automated platforms.
PSO2	Manage information to enable effective, timely, accurate and cost-effective reporting of laboratory-generated information, and make specimen-oriented decisions on predetermined criteria, including a working knowledge of critical values.
PSO3	Process information and ensure quality control as appropriate to routine and specialised laboratory procedures.

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11. Graduate Roles and Broader Competency Domains

Role / domain	Linked programme outcomes	Broader competency focus
Medical laboratory practitioner	PO1, PO2, PO6, PSO1	Specimen management, analytical performance, instrumentation, result generation and total testing process across all laboratory disciplines.
Quality-assurance practitioner	PO2, PO6, PO10, PSO3	Internal quality control, external quality assessment, ISO 15189/NABL documentation, audit, indicators and continual improvement.
Safety and infection-control practitioner	PO2, PO3, PO4	Biosafety levels, standard precautions, spill and exposure management, immunisation and biomedical waste management.
Ethical and professional practitioner	PO4, PO10	Legal and ethical standards, consent, confidentiality, medico-legal records, registration and professional accountability.
Communicator and information manager	PO5, PO9, PSO2	Reporting, critical-value notification, documentation, laboratory information systems and data privacy.
Evidence-based practitioner and lifelong learner	PO6, PO7, PO10	Literature retrieval and appraisal, method verification and validation, reflective practice and continuing professional development.
Inter-professional team member	PO3, PO5	Collaboration with clinicians, nursing, blood centres, infection-control and public-health teams and appropriate referral.
Leader, mentor and entrepreneur	PO8, PO10	Workflow, inventory and resource management, mentorship, training and independent laboratory practice.

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Professional Competency Statements and Monitorable Indicators

Code	Competency statement	Representative monitorable indicators
PC1	Collect, receive, identify and accession clinical specimens correctly and safely.	Verify patient identity and test request; apply correct phlebotomy and collection technique; use correct container, additive, order of draw and labelling.
PC2	Preserve, transport, store and dispose of specimens while maintaining specimen integrity.	Apply temperature, time and preservative requirements; maintain chain of custody; recognise and record rejection criteria.
PC3	Prepare reagents, stains, media, standards and controls and verify their fitness for use.	Calculate and prepare solutions accurately; verify sterility, performance and expiry; document preparation and lot details.
PC4	Operate, calibrate, verify and maintain laboratory instruments and automated analysers.	Perform start-up, calibration, function checks, preventive maintenance and documented troubleshooting.
PC5	Perform routine and specialised analytical procedures across laboratory disciplines.	Follow validated SOPs in haematology, biochemistry, microbiology, immunology, transfusion medicine, cytology and histopathology and molecular diagnostics.
PC6	Recognise, investigate and correct pre-analytical, analytical and post-analytical errors.	Identify error sources; apply corrective and preventive action; escalate appropriately and record outcomes.
PC7	Perform internal quality control and participate in external quality assessment.	Run and interpret controls, Levey-Jennings charts and Westgard rules; act on out-of-control events; participate in EQAS/PT.
PC8	Apply quality management, accreditation and documentation requirements to laboratory work.	Work to ISO 15189 / NABL requirements; maintain SOPs, records, audits, indicators and non-conformity registers.
PC9	Interpret laboratory data, recognise abnormal and critical values and validate results.	Apply reference intervals, delta checks and clinical correlation; recommend confirmatory or repeat testing.
PC10	Generate, verify, release and communicate accurate laboratory reports within turnaround time.	Ensure report accuracy and completeness; notify critical values promptly and record the notification.
PC11	Practise biosafety, infection control and biomedical waste management.	Apply standard precautions, PPE, spill management, biosafety levels, immunisation and BMW Rules 2016 colour coding.

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Code	Competency statement	Representative monitorable indicators
PC12	Use laboratory information systems and health information technology responsibly.	Perform accurate data entry, retrieval and back-up; protect data privacy, integrity and confidentiality.
PC13	Communicate effectively with clinicians, patients, donors, peers and the laboratory team.	Explain procedures, obtain consent, counsel donors, hand over information accurately and document communication.
PC14	Practise ethically and lawfully with professional accountability and confidentiality.	Apply codes of conduct, consent, medico-legal requirements, research ethics and registration obligations.
PC15	Work collaboratively within inter-professional healthcare and public-health teams.	Respect roles, share relevant information, participate in clinical and infection-control committees and referral pathways.
PC16	Retrieve, appraise and apply scientific literature and evidence to laboratory practice.	Define search terms, appraise study quality, identify knowledge gaps and apply evidence to method selection.
PC17	Participate in laboratory-based research, method verification, validation and innovation.	Frame researchable questions, apply biostatistics, verify methods and document validation.
PC18	Demonstrate leadership, mentorship, resource management and continuing professional development.	Manage inventory, workflow and time; train juniors; maintain a CPD record and reflective practice.

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Competency-Level and Assessment Legend

Level	Meaning	Typical verbs	Illustrative assessment
K	Knows	Define, list, describe	MCQ, SAQ, short essay
KH	Knows how	Explain, analyse, interpret, identify, recognise	Structured essay, case/problem, viva
S	Shows	Demonstrate in a controlled context	Demonstration, spotter, simulation
SH	Shows how	Demonstrate correctly at a practical/laboratory station	OSPE, practical examination, structured observation
P	Performs independently	Perform safely and consistently in authentic laboratory practice	Workplace-based assessment, portfolio/logbook, supervised laboratory assessment

Revised Bloom's Taxonomy Learning-Level Legend

Level	Cognitive process	Representative verbs	Typical evidence
L1	Remember	Define, list, identify, recall	Accurate recall of facts, terms and foundational knowledge
L2	Understand	Explain, describe, classify, discuss	Meaningful explanation, classification or summary
L3	Apply	Use, demonstrate, perform, calculate	Application of knowledge or procedure in a familiar context
L4	Analyze	Analyse, compare, differentiate, interpret	Separation, correlation and interpretation of information
L5	Evaluate	Appraise, justify, critique, recommend	Reasoned judgment using explicit criteria or evidence
L6	Create	Design, develop, formulate, construct	Production of an original plan, product, solution or communication

Using both frameworks: The competency-performance scale (K/KH/S/SH/P) indicates the degree of professional performance expected, whereas Revised Bloom's Taxonomy (L1-L6) indicates the dominant cognitive demand. They are complementary and should not be treated as interchangeable.

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Programme Structure at a Glance

Phase	Contact hours	Credits	Marks
First Year (Semesters I and II)	765	40	1400
Second Year (Semesters III and IV)	780	40	1400
Third Year (Semesters V and VI)	780	40	1400
Fourth Year - Internship (Semesters VII and VIII)	1800	40	600
Programme Total	**4125**	**160**	**4800**

Credit basis: 1 credit per 15 lecture or tutorial hours; 1 credit per 30 practical hours; 1 credit per 45 clinical-laboratory posting hours, as prescribed by NCAHP. A minimum of 160 credits is required for the award of the BMLS degree.

Semester	Contact hours	Credits	Marks
Semester I	375	20	700
Semester II	390	20	700
Semester III	390	20	700
Semester IV	390	20	700
Semester V	390	20	700
Semester VI	390	20	700
Semesters VII and VIII (Internship)	1800	40	600
Total	**4125**	**160**	**4800**

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Admission, Duration, Attendance and Progression

Item	Provision
Nomenclature	Bachelor of Medical Laboratory Science (BMLS).
Duration	Four years, comprising six taught semesters (Semesters I to VI) and a compulsory one-year internship (Semesters VII and VIII).
Eligibility for admission	• Passed Senior Secondary (10+2) or equivalent examination with Physics, Chemistry and Biology (Botany and Zoology) subjects. • Admission on the basis of merit of Senior Secondary (10+2), as per the criteria notified by the University/NCAHP for the relevant admission year. • Completed 17 years of age at the time of admission, or completing that age on or before 31 December of the year of admission to the first year of the programme. • Lateral entry: candidates who have passed the Diploma in Medical Laboratory Technology (D.MLT) with 50% marks are eligible for direct admission to the second year (3rd semester). • Medical fitness certificate, endorsed by a Government Medical Officer, is mandatory at the time of admission. • Reservation policy for admission shall be as per State/Centre Government norms. • Foreign national candidates: admission on the basis of the University Entrance Examination merit list, subject to an equivalence eligibility certificate from the respective State Allied and Healthcare Council and verification of valid visa status by the institution and University before enrolment. • Admission criteria are updated by NCAHP from time to time; the admission process is conducted by the State/Union Territory/University.
Medium of instruction	English.
Attendance	A candidate shall secure a minimum of 80% attendance in theory and 80% in practical/skills training in each course to be eligible to appear for the University examination. No relaxation is permissible on any ground.
Promotion: First to Second Year	A minimum of 70% of the total credits at the end of the first year (Semesters I and II).
Promotion: Second to Third Year	A cumulative minimum of 80% of the total credits at the end of the second year (Semesters I to IV).
Eligibility for internship	Successful completion of the entire coursework, that is 100% of the credits of Semesters I to VI.

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Item	Provision
Internship stipend	During the period of internship, stipend amount must be paid to the students by the institute, as decided by the respective State Allied and Healthcare Council.
Maximum duration	All academic coursework shall be completed within a maximum of double the programme duration, that is eight years from the date of admission. Failure to do so shall result in exit from the programme.
Award of degree	The degree shall be awarded only upon successful completion of the internship requirements and on satisfying all University regulations.

Note: The eligibility for admission and internship stipend provisions above incorporate NCAHP Corrigendum-1 (File No. Z-1011/2026/NCAHP/AHS-MLS Curriculum), New Delhi, dated 20 March 2026, to the Competency Based Curriculum for Medical Laboratory Sciences (notified 15.10.2025).

Scheme of Examination

Assessment and Evaluation

The academic performance of a candidate is assessed on the basis of both Continuous Internal Evaluation (CIE) and End-Semester Examination (ESE) in each semester, in the ratio of 30% for CIE and 70% for ESE, subject to the NUES provisions set out later in this section.

Continuous Internal Evaluation (CIE)

- 30% of the total marks of each course is allotted to CIE.
- 50% of CIE shall be based on the average of marks obtained in two notified formative written tests. Absence without prior permission from a formative test shall result in that test being scored as zero.
- The remaining 50% of CIE shall be based on internal assessment in the form of evaluation seminars, journal club presentations, case presentations, completion of assignments, laboratory records and similar activities, as specified in the individual course curricula.
- CIE shall be conducted for the theory and practical components of each course, wherever applicable.
- A candidate must secure at least 40% of the total marks fixed for CIE in a particular course to be eligible to appear for the End-Semester Examination (ESE) in that course.

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End-Semester Examination (ESE)

There shall be a University examination at the end of each semester. To be eligible to appear for the University examination, a candidate shall:

- Have undergone satisfactorily the approved programme of study for the prescribed duration.
- Secure not less than 80% attendance separately in theory and in practical/skills training, in each course.
- Secure at least 50% of the total marks fixed for CIE in the particular course
- Fulfil any other requirement prescribed by RGUHS from time to time.

The End-Semester Examination shall consist of a Theory examination for all University courses and, in addition, a Practical examination for the courses so designated in the Semester Examination Scheme tables.

Theory Examination

Written tests, with question types, pattern, duration and weightage as prescribed in the RGUHS-approved Theory, Practical and Clinical Laboratory Examination Guidelines for the BMLS programme; setting of question papers and evaluation of answer scripts shall be as per University regulations.

Practical Examination

Broad outline shall be in the form of spotters and specimen/slide identification, demonstration of laboratory equipment and technique handling, and case-based/OSPE discussions, as detailed in the Theory, Practical and Clinical Laboratory Examination Guidelines for the BMLS programme.

Criteria for Pass

A candidate must score at least 50% separately in theory and in practical, wherever applicable, to be declared as passed in that course. In case of failure, the candidate shall subsequently appear for both the theory and practical examination of the University in that course.

Re-totaling

There is no scope of re-totalling or revaluation. NA correction may be applied as per the university norms.

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Supplementary Examinations

- Supplementary examinations shall be conducted by the University for the benefit of unsuccessful candidates; lower-semester examinations shall be conducted along with the current semester examinations for this purpose.
- A candidate detained for shortage of attendance shall be barred from appearing in any or all courses for the supplementary examination.
- A candidate permitted to appear for the supplementary examination may improve internal assessment marks before the examination by subjecting himself/herself to internal assessment.

Grading and Classification

The performance of a candidate shall be evaluated according to a Letter Grading System based on both CIE and ESE. The letter grades (O, S, A+, A, B+, B, F and I) indicate the level of academic achievement assessed on a 10-point scale (0 to 10):

Marks Range (%)	Grade Point	Letter Grade	Descriptor	Classification	CGPA
90 & above	10	O	Outstanding	First Class with Distinction	7.00 and above
80–89	9	S	Excellent	First Class with Distinction	7.00 and above
70–79	8	A+	Very Good	First Class	6.00–6.99
60–69	7	A	Good	First Class	6.00–6.99
55–59	6	B+	Average	Second Class	5.50–5.99
50–54	5	B	Pass	Pass Class	5.00–5.49
Below 50	0	F	Fails	Fail	Less than 4.00
Absent	0	I	Absent	—	—

For non-credit (NUES) courses, 'Satisfactory' (P) or 'Unsatisfactory' (F) shall be indicated instead of a letter grade, and this shall not be counted in the computation of SGPA/CGPA, consistent with the NUES implementation provisions below.

- A candidate is considered to have completed a course successfully and earned the credits assigned if an acceptable letter grade in the range O–B is secured. Letter grade 'F' in any course implies failure in that course and no credit is earned.

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- A candidate having satisfactory attendance and meeting the CIE passing standard in a course but remaining absent from the ESE shall be awarded an 'I' grade in that course.
- DT = Detained for shortage of attendance. A candidate awarded DT status is not permitted to appear for the ESE in the course(s) concerned until the attendance deficiency is made good, as per the Attendance provision in the Admission, Duration, Attendance and Progression table above.

Grade Point Averages (SGPA and CGPA)

Semester Grade Point Average (SGPA) = Σ [(course credit) × (grade point)] for all courses with letter grades, including F, divided by Σ (course credits) for all courses with letter grades, including F.

Cumulative Grade Point Average (CGPA) = Σ [(course credit) × (grade point)] for all courses for all semesters with letter grades, excluding F, divided by Σ (course credits) for all courses for all semesters with letter grades, excluding F.

Conversion of Grades into Percentage

Percentage of marks scored = CGPA earned × 10. Illustration: CGPA earned 8.18 × 10 = 81.80%.

Award of Class

The candidate who has passed all prescribed courses shall be declared to have passed the programme. Class shall be awarded only to those who pass the entire examination in the first attempt, on the basis of the aggregate of marks scored in the individual semesters:

- GPA ≥ 7.00 in the first attempt: First Class with Distinction.
- GPA ≥ 6.00 but less than 7.00 in the first attempt: First Class.
- GPA ≥ 5.00 but less than 6.00 in the first attempt: Second Class.
- GPA ≥ 4.00 but less than 5.00 in the first attempt: Pass Class.
- Candidates who pass in more than one attempt shall be declared as passed in the 'Pass' class, irrespective of the percentage of marks secured.
- An attempt means the appearance of a candidate for one or more courses, in part or in full, in a particular examination. A candidate who submits an application for an examination but does not appear for any course, in full or in part, may appear for the supplementary examination (subject to

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attendance and internal assessment requirements being fulfilled), and such appearance shall be considered the first attempt.

NUES implementation: Courses marked as non-University examination subjects (NUES) shall be conducted and assessed at the college or institution level as prescribed by the RGUHS. Earned credits may be based on the grades secured in institutional examinations. RGUHS may prescribe structured internal and practical assessment rubrics and question-paper blueprints for all courses.

NUES Guidelines

Carry-Over Benefit

A candidate who does not clear all the courses of a particular semester in the University examinations may avail of the carry-over benefit, subject to the following:

- A candidate who fails in not more than 2 courses of Semester I is allowed to move to Semester II; such a candidate shall take both the Semester I backlog courses and the Semester II courses together. A candidate with a backlog of not more than 2 courses in Semester II is allowed to proceed to Semester III until all Semester I courses are cleared.
- A candidate with a backlog of not more than 2 courses in Semester III is allowed to proceed to Semester IV until all Semester II courses are cleared.
- A candidate with a backlog of not more than 2 courses in Semester IV is allowed to proceed to Semester V until all Semester III courses are cleared.
- A candidate with a backlog of not more than 2 courses in Semester V is allowed to proceed to Semester VI until all Semester IV courses are cleared.
- Results shall be declared at the end of Semester VI only when all backlog courses have been cleared.

Maximum Attempts

Not more than three attempts shall be allowed for a candidate to pass any course. Failure to clear a course within three attempts shall be considered as withdrawal from the course, subject to the Maximum duration provision in the Admission, Duration, Attendance and Progression table above.

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Part I - First-Year BMLS (Semesters I and II)

Foundational biomedical sciences, laboratory orientation, safety, communication, computing and the first core laboratory disciplines.

Semester I - Course Structure, Hours and Credits

Sl. No.	Course	Lecture	Tutorial	Practical	Credits	Contact hours
1	BMLS-101 Human Anatomy	3	1	4	6	120
2	BMLS-102 Human Physiology	3	1	4	6	120
3	BMLS-103 Fundamentals of the Healthcare System and Medical Laboratory Science #	2	0	0	2	30
4	BMLS-104 Communication and Professionalism #	2	0	0	2	30
5	BMLS-105 Basic Emergency Care and First Aid	1	1	0	2	30
6	BMLS-106 Basics of Computer Application	1	0	1	2	45
	Grand Total	**12**	**3**	**9**	**20**	**375**

 # Non-University examination subject (NUES), conducted at the institution level as prescribed by the RGUHS Board of Studies. Prescribed semester totals: 375 contact hours and 20 credits.

Semester I - Examination Scheme

Course	Continuous (internal) assessment	End-semester examination	Total	Status
BMLS-101 Human Anatomy	30	70	100	University
BMLS-102 Human Physiology	30	70	100	University
BMLS-103 Fundamentals of the Healthcare System and Medical Laboratory Science	15	35	50	NUES
BMLS-104 Communication and Professionalism	15	35	50	NUES

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Course	Continuous (internal) assessment	End-semester examination	Total	Status
BMLS-105 Basic Emergency Care and First Aid	30	70	100	University
BMLS-106 Basics of Computer Application	30	70	100	University
BMLS-101 Human Anatomy Practical	30	70	100	University
BMLS-102 Human Physiology Practical	30	70	100	University
Grand Total	**210**	**490**	**700**	

Semester I - Course-to-Competency Overview

Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-101 Human Anatomy	Provides the structural foundation of medical laboratory science, covering general anatomy, histology of basic tissues, the musculoskeletal, cardiovascular, respiratory, digestive, urinary, endocrine, nervous, lymphoid and reproductive systems, and the surface and applied anatomy required for specimen collection and correlation.	PO1, PO2, PO6, PO7	PC1, PC5, PC9, PC16
BMLS-102 Human Physiology	Develops understanding of normal cellular, systemic and integrative human physiology, with emphasis on blood, homeostasis, organ-system function and the physiological basis of laboratory reference intervals and diagnostic measurement.	PO1, PO2, PO6, PO7	PC5, PC9, PC13, PC16

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Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-103 Fundamentals of the Healthcare System and Medical Laboratory Science	Introduces the Indian healthcare delivery system, the organisation and classification of clinical laboratories, laboratory safety and biomedical waste management, laboratory records under ISO 15189, medical terminology and the regulatory and professional bodies governing the profession.	PO1, PO3, PO4, PO5, PO10	PC8, PC11, PC12, PC14, PC15
BMLS-104 Communication and Professionalism	Develops functional English, professional and therapeutic communication, personal and professional etiquette, presentation and career skills, and the personal and professional values required for ethical laboratory practice.	PO4, PO5, PO7, PO10	PC10, PC13, PC14, PC15, PC18
BMLS-105 Basic Emergency Care and First Aid	Trains the learner, through the DOAP model, to assess emergencies safely, provide first aid for common injuries and poisoning, recognise and manage shock, monitor vital signs and perform Basic Life Support in adult and paediatric victims.	PO2, PO3, PO5, PO10	PC1, PC11, PC13, PC15
BMLS-106 Basics of Computer Application	Develops practical competence in computer operations, productivity software, data handling, presentation, networks and internet use, with introductory application to laboratory information systems and health data.	PO7, PO9, PO10	PC10, PC12, PC16, PC17
BMLS-101 Human Anatomy Practical	Trains the learner to identify anatomical planes and positions, histological sections of basic tissues and the gross structures of major organ systems on models, specimens, slides and images.	PO1, PO2, PO7	PC5, PC9, PC16
BMLS-102 Human Physiology Practical	Trains the learner in basic physiological measurement and haematological procedures, including microscopy, blood cell counts, haemoglobin estimation, blood grouping, bleeding and clotting time and the recording of vital parameters.	PO1, PO2, PO7	PC1, PC4, PC5, PC9

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BMLS-101 - Human Anatomy

Course code	BMLS-101	**Course title**	Human Anatomy
Hours	Lecture 3 | Tutorial 1 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC1, PC5, PC9, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-101 with its corresponding practical course, Human Anatomy Practical. Combined course credit for BMLS-101 is 6 (Theory 4 + Practical 2).

Subject Description

Provides the structural foundation of medical laboratory science, covering general anatomy, histology of basic tissues, the musculoskeletal, cardiovascular, respiratory, digestive, urinary, endocrine, nervous, lymphoid and reproductive systems, and the surface and applied anatomy required for specimen collection and correlation.

Course rationale (NCAHP): Students will understand the structure and function of organs and organ systems in the human body.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
HA-CO1	Comprehend the gross, functional and applied anatomy of various structures in the human body.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC1, PC5, PC9, PC16
HA-CO2	Identify the microscopic structures of various tissues and organs in the human body and correlate the structure with the functions.	KH/SH	L4 Analyze	PO1, PO2, PO6, PO7 PC1, PC5, PC9, PC16

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
HA-CO3	Comprehend the basic structure and connections between the various parts of the central nervous system so as to analyse the integrative and regulative functions of the organs and systems.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC1, PC5, PC9, PC16
HA-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC1, PC5, PC9, PC16
HA-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC1, PC5, PC9, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	General Anatomy: Introduction to Anatomy, terms and terminology. Regions of Body, Cavities and Systems. Surface anatomy – Musculoskeletal, vascular, cardio-pulmonary syst…	4
2	Tissues- Classification and description of the basic tissues of the body. Histology: Epithelium, compact bone, muscles, connective tissue, nervous tissue, artery, vein an…	4
3	Musculoskeletal system: • Bone structure, blood supply, ossification, and classification. • Muscle classification, structure, types and functional aspects. • Joints–class…	8
4	Respiratory system: Structure of the upper and lower respiratory tract. Thorax: Pleural cavities & pleura, Lungs and respiratory tree, Heart and great vessels, Diaphr…	6
5	Digestive system - Parts/Structure of digestive system, Abdominal cavity - divisions, Muscles of abdominal wall, Liver, Pancreas, Spleen, Alimentary canal, Gall bladder, …	6
6	Excretory System: Anatomy of the Kidney. Structure of the kidney, ureter, urinary bladder, male and female urethra. General description of pelvic organs. Lymphatic system…	6
7	Cardiovascular system: Circulatory system – major arteries and veins of the body, structure of blood vessels, Heart structure, positions, chambers, valves, internal &…	8
8	Nervous system: Classification of the nervous system. Nerve – structure, classification, microscopy with examples. Spinal cord- anatomy, structure and features of Meninge…	6
9	Sensory system: Structure of the Visual system, Auditory system, Gustatory system, Olfactory system, Somatosensory system, Skin	6
10	Reproductive system: Structure of male and female reproductive organs. Endocrine system: Pituitary gland, Thyroid, Parathyroid	6
	Total	**60**

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Unit 1 (4 hours)

HA 1.1. General Anatomy: Introduction to Anatomy, terms and terminology. Regions of Body, Cavities and Systems [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HA 1.2. Surface anatomy – Musculoskeletal, vascular, cardio-pulmonary system. General Embryology [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (4 hours)

HA 2.1. Tissues- Classification and description of the basic tissues of the body [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HA 2.2. Histology: Epithelium, compact bone, muscles, connective tissue, nervous tissue, artery, vein and lymphatic tissue [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HA 2.3. Connective tissue & its modification, tendons, membranes, and special connective tissue [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (8 hours)

HA 3.1. Musculoskeletal system: • Bone structure, blood supply, ossification, and classification. • Muscle classification, structure, types and functional aspects. • Joints–classification, structures of joints, movements, range, blood supply, nerve supply, dislocations [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (6 hours)

HA 4.1. Respiratory system: Structure of the upper and lower respiratory tract [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HA 4.2. Thorax: Pleural cavities & pleura, Lungs and respiratory tree, Heart and great vessels, Diaphragm [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 5 (6 hours)

HA 5.1. Digestive system - Parts/Structure of digestive system, Abdominal cavity - divisions, Muscles of abdominal wall, Liver, Pancreas, Spleen, Alimentary canal, Gall bladder, Intestine (small & large), and accessory organs of digestion [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (6 hours)

HA 6.1. Excretory System: Anatomy of the Kidney. Structure of the kidney, ureter, urinary bladder, male and female urethra [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HA 6.2. General description of pelvic organs. Lymphatic system- Lymphatic vessels and lymph, lymph nodes, Spleen. Mediastinum – division and contents [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (8 hours)

HA 7.1. Cardiovascular system: Circulatory system – major arteries and veins of the body, structure of blood vessels, Heart structure, positions, chambers, valves, internal & external features, Blood supply to heart, Conductive system of heart [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 8 (6 hours)

HA 8.1. Nervous system: Classification of the nervous system. Nerve – structure, classification, microscopy with examples [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HA 8.2. Spinal cord- anatomy, structure and features of Meninges, Ventricles of the brain, CSF circulation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 9 (6 hours)

HA 9.1. Sensory system: Structure of the Visual system, Auditory system, Gustatory system, Olfactory system, Somatosensory system, Skin [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 10 (6 hours)

HA 10.1. Reproductive system: Structure of male and female reproductive organs. Endocrine system: Pituitary gland, Thyroid, Parathyroid [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-102 - Human Physiology

Course code	BMLS-102	**Course title**	Human Physiology
Hours	Lecture 3 | Tutorial 1 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC5, PC9, PC13, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-102 with its corresponding practical course, Human Physiology Practical. Combined course credit for BMLS-102 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of normal cellular, systemic and integrative human physiology, with emphasis on blood, homeostasis, organ-system function and the physiological basis of laboratory reference intervals and diagnostic measurement.

Course rationale (NCAHP): Students will gain knowledge of the organisation of human body cells, tissues, blood and physiological functions of various organ systems of the human body

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
HP-CO1	Understand the functioning of various organ systems of the body and their interactions.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC9, PC13, PC16
HP-CO2	Elucidate the physiological aspects of normal growth and development.	K/KH	L1-L2 Remember - Understand	PO1, PO2, PO6, PO7 PC5, PC9, PC13, PC16

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
HP-CO3	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC5, PC9, PC13, PC16
HP-CO4	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC5, PC9, PC13, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

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Unit distribution and hours

Unit	Topic	Hours
1	General Physiology- Cell: morphology, structure and function of cell organelles, Structure of cell membrane, Transport across cell membrane, Intercellular communication, …	4
2	Blood-Introduction-composition & function of blood, WBC, RBC, Platelets formation & functions, Immunity, Plasma: composition, formation & functions, Plasma Pr…	4
3	Nervous system and muscle: Organisation of the nervous system. Structure and function of muscle and nerve cells. Functions of the brain, the Spinal cord, the cranial and …	8
4	Respiratory System: General organisation, Mechanics of respiration, Regulation of respiration, Gaseous exchange in lungs and tissues, Pulmonary ventilation, volumes and c…	6
5	Digestive System-Digestion & absorption of nutrients, Gastrointestinal secretions & their regulation, Functions of Liver, pancreas & stomach, Gastrointestinal…	6
6	Renal System: Functions of the kidney, urine formation, Glomerular filtration rate, clearance, Tubular function. Water excretion, concentration of urine-regulation of Na+…	6
7	Lymphatic and immunological system: Lymph glands and circulation of lymph, Spleen structure and function, Immunity – Formation of T-cells and B-cells, Antigen, Antibody a…	6
8	Cardiovascular system: Functions of the heart, organisation of the cardiovascular system, structure and properties of cardiac muscles. Cardiac output, cardiac cycle, and …	8
9	Endocrine system- Physiology of the endocrine glands – Pituitary, Pineal Body, Thyroid, Parathyroid, Adrenal, Gonads, Thymus, Pancreas. Hormones secreted by these glands,…	8
10	Male and female reproductive system: Male: functions of testes & penis, pubertal changes in males, testosterone: action & regulations of secretion, ejaculatory me…	6
	Total	**62**

Unit 1 (4 hours)

HP 1.1. General Physiology- Cell: morphology, structure and function of cell organelles, Structure of cell membrane, Transport across cell membrane, Intercellular communication, Homeostasis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 2 (4 hours)

HP 2.1. Blood-Introduction-composition & function of blood, WBC, RBC, Platelets formation & functions, Immunity, Plasma: composition, formation & functions, Plasma Proteins:-types & functions, Blood Groups- types, significance, determination, Haemoglobin, Haemostasis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (8 hours)

HP 3.1. Nervous system and muscle: Organisation of the nervous system. Structure and function of muscle and nerve cells [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HP 3.2. Functions of the brain, the Spinal cord, the cranial and spinal nerves, and the Motor system.Sensory system [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HP 3.3. ANS, Synapse, neuromuscular transmission reflex arc, reflex action and reflexes, Cerebrospinal fluid [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (6 hours)

HP 4.1. Respiratory System: General organisation, Mechanics of respiration, Regulation of respiration, Gaseous exchange in lungs and tissues, Pulmonary ventilation, volumes and capacities, Effect of exercise on respiration, hypoxia [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (6 hours)

HP 5.1. Digestive System-Digestion & absorption of nutrients, Gastrointestinal secretions & their regulation, Functions of Liver, pancreas & stomach, Gastrointestinal tract disorders [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 6 (6 hours)

HP 6.1. Renal System: Functions of the kidney, urine formation, Glomerular filtration rate, clearance, Tubular function [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HP 6.2. Water excretion, concentration of urine-regulation of Na+, Cl-, K+ excretion, Physiology of urinary bladder [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (6 hours)

HP 7.1. Lymphatic and immunological system: Lymph glands and circulation of lymph, Spleen structure and function, Immunity – Formation of T-cells and B-cells, Antigen, Antibody and Immune response [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 8 (8 hours)

HP 8.1. Cardiovascular system: Functions of the heart, organisation of the cardiovascular system, structure and properties of cardiac muscles [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HP 8.2. Cardiac output, cardiac cycle, and conducting system of the heart. Heart sounds, regulation of heart rate, pulse, blood pressure and its regulation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HP 8.3. ECG, cardio- respiratory changes during exercise [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 9 (8 hours)

HP 9.1. Endocrine system- Physiology of the endocrine glands – Pituitary, Pineal Body, Thyroid, Parathyroid, Adrenal, Gonads, Thymus, Pancreas [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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HP 9.2. Hormones secreted by these glands, their classifications, and their functions [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 10 (6 hours)

HP 10.1. Male and female reproductive system: Male: functions of testes & penis, pubertal changes in males, testosterone: action & regulations of secretion, ejaculatory mechanism & dysfunction Female: functions of ovaries and uterus, pubertal changes, menstrual cycle, oestrogens and progesterone action and regulation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

HP 10.2. Physiological changes during pregnancy, Placenta and placental circulation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

BMLS-103 - Fundamentals of the Healthcare System and Medical Laboratory Science

Course code	BMLS-103	**Course title**	Fundamentals of the Healthcare System and Medical Laboratory Science
Hours	Lecture 2 | Tutorial 0 | Practical 0 | Total contact hours 30	**Credits**	2
Examination status	Non-University examination subject (NUES): internal assessment 15; institutional end-semester examination 35; total 50.	**Primary PO alignment**	PO1, PO3, PO4, PO5, PO10
Primary competency alignment	PC8, PC11, PC12, PC14, PC15	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

Subject Description

Introduces the Indian healthcare delivery system, the organisation and classification of clinical laboratories, laboratory safety and biomedical waste management, laboratory records under ISO 15189, medical terminology and the regulatory and professional bodies governing the profession.

Course rationale (NCAHP): This course provides students with a comprehensive understanding of the Indian health care delivery system and the Clinical Laboratory in the health care system. Students will also understand the roles, responsibilities, and regulatory bodies of medical laboratory sciences.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
FHS-CO1	Comprehend knowledge of the healthcare delivery system in India.	KH	L2 Understand	PO1, PO3, PO4, PO5, PO10 PC8, PC11, PC12, PC14, PC15

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
FHS-CO2	Identify the laboratory safety measures and biomedical safety management.	K	L1 Remember	PO1, PO3, PO4, PO5, PO10 PC8, PC11, PC12, PC14, PC15
FHS-CO3	Understand the organisation, the importance of Clinical labs, Lab professionals and regulatory professional bodies.	KH	L2 Understand	PO1, PO3, PO4, PO5, PO10 PC8, PC11, PC12, PC14, PC15
FHS-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO3, PO4, PO5, PO10 PC8, PC11, PC12, PC14, PC15
FHS-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO3, PO4, PO5, PO10 PC8, PC11, PC12, PC14, PC15

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Group discussion, role play and simulation
- Field/laboratory visit and structured observation
- Assignment, seminar and presentation
- Reflective writing and portfolio task
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback.

Assessment Methods

- Class participation and presentation
- Assignment and quiz
- Structured observation and rubric-based rating
- Portfolio/reflective submission
- Institutional sessional examination
- Viva voce

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Introduction to healthcare delivery system - Healthcare delivery system in India at primary, secondary and tertiary care, classification of hospitals based on system of m…	6
2	Visit to Clinical laboratories, Introduction to clinical Laboratory, Classification of Laboratory, Introduction to various sections/departments in clinical laboratories, …	8
3	Lab safety measures- Infection control, Universal precautions, PPE, Vaccination, Chemical, physical, electrical and fire safety. Biomedical waste management	4
4	Records and their importance in a hospital, Records maintained in the Laboratory as per ISO 15189, importance of records and reports, Data entry and management on an elec…	3
5	Medical terminology - Derivation of medical terms, Basic medical terms, form medical terms utilising roots, suffixes, prefixes, and combining roots, Interpret basic medic…	6
6	Regulatory Bodies & Professional Organisations: Roles & Responsibilities – MoHFW, NCAHP, State Council, Registration	3
	Total	**30**

Unit 1 (6 hours)

FHS 1.1. Introduction to healthcare delivery system - Healthcare delivery system in India at primary, secondary and tertiary care, classification of hospitals based on system of medicine, Community participation in healthcare delivery system, National Health Mission, National Health Policy, Issues in Health Care Delivery System in India [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (8 hours)

FHS 2.1. Visit to Clinical laboratories, Introduction to clinical Laboratory, Classification of Laboratory, Introduction to various sections/departments in

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clinical laboratories, Lab space and designing, Knowledge of lab organisational chart, Role of Laboratory in patient care [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (4 hours)

FHS 3.1. Lab safety measures- Infection control, Universal precautions, PPE, Vaccination, Chemical, physical, electrical and fire safety; Biomedical waste management [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (3 hours)

FHS 4.1. Records and their importance in a hospital, Records maintained in the Laboratory as per ISO 15189, importance of records and reports, Data entry and management on an electronic health record system [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

nit 5 (6 hours)

FHS 5.1. Medical terminology - Derivation of medical terms, Basic medical terms, form medical terms utilising roots, suffixes, prefixes, and combining roots, Interpret basic medical abbreviations/symbols [Competency: KH/SH | Revised Bloom: L4 (Analyze) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (3 hours)

FHS 6.1. Regulatory Bodies & Professional Organisations: Roles & Responsibilities – MoHFW, NCAHP, State Council, Registration [Competency: KH | Revised Bloom: L2 (Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Suggested Readings

1. Textbook of Medical laboratory Technology, Mirnali Sant, CBS publishers. 2022
2. Textbook of Medical laboratory Technology, Ramnik Sood, Jaypee Publishers, 2006
3. Textbook of Medical laboratory Technology, Godkar PB, Bhalani Publishing House, 2024

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BMLS-104 - Communication and Professionalism

Course code	BMLS-104	**Course title**	Communication and Professionalism
Hours	Lecture 2 | Tutorial 0 | Practical 0 | Total contact hours 30	**Credits**	2
Examination status	Non-University examination subject (NUES): internal assessment 15; institutional end-semester examination 35; total 50.	**Primary PO alignment**	PO4, PO5, PO7, PO10
Primary competency alignment	PC10, PC13, PC14, PC15, PC18	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

Subject Description

Develops functional English, professional and therapeutic communication, personal and professional etiquette, presentation and career skills, and the personal and professional values required for ethical laboratory practice.

Course rationale (NCAHP): The course comprises the study and development of the English language, listening, speaking, reading, and writing, which help students communicate well in academic and professional environments

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CP-CO1	Develop good communication skills.	K/KH	L1-L2 Remember - Understand	PO4, PO5, PO7, PO10 PC10, PC13, PC14, PC15, PC18
CP-CO2	Trains the students in oral presentations, expository writing, logical organisation and structural support.	K/KH	L1-L2 Remember - Understand	PO4, PO5, PO7, PO10 PC10, PC13, PC14, PC15, PC18

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CP-CO3	Develops professionalism, understands professional ethics and values for professional success.	K/KH	L1-L2 Remember - Understand	PO4, PO5, PO7, PO10 PC10, PC13, PC14, PC15, PC18
CP-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO4, PO5, PO7, PO10 PC10, PC13, PC14, PC15, PC18
CP-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO4, PO5, PO7, PO10 PC10, PC13, PC14, PC15, PC18

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Group discussion, role play and simulation
- Field/laboratory visit and structured observation
- Assignment, seminar and presentation
- Reflective writing and portfolio task
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback.

Assessment Methods

- Class participation and presentation
- Assignment and quiz
- Structured observation and rubric-based rating
- Portfolio/reflective submission
- Institutional sessional examination
- Viva voce

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Communication Skills: The Importance of Communication, The Communication Process. Barriers to communication: Physiological, Physical, Cultural, Language, Gender, Interper…	4
2	Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment. E…	4
3	Developing personal etiquette: personal appearance, importance of grooming, acknowledging and respecting, maintaining professionalism, cubicle etiquette, time management,…	4
4	Developing presentation and career skills: Introduction, Importance of Resume and CV, preparing Resume and CV, Interview Skill Tips, FAQ During Interviews, Mock interview…	8
5	Professional values - Integrity, Objectivity, Confidentiality, Professional competence and due care, professional risks, professional responsibility, accountability, prof…	3
6	Personal Values - Ethical and Moral values, Attitude and behaviour, Personal Hygiene and Mental Health	3
7	Integration, revision, tutorial, structured problem-solving and formative assessment mapped to the course outcomes of this course (RGUHS reconciliation of the prescribed …	4
	Total	**30**

Unit 1 (4 hours)

CP 1.1. Communication Skills: The Importance of Communication, The Communication Process [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CP 1.2. Barriers to communication: Physiological, Physical, Cultural, Language, Gender, Interpersonal, Psychological and Emotional barriers [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM:

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interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (4 hours)

CP 2.1. Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CP 2.2. Elements of Communication: Introduction, Face-to-Face Communication, Tone of Voice, Body Language (Non-verbal communication), Verbal Communication [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (4 hours)

CP 3.1. Developing personal etiquette: personal appearance, importance of grooming, acknowledging and respecting, maintaining professionalism, cubicle etiquette, time management, attending classes, meetings, seminars, etc, table manners, greeting, Netiquette and Telephonic conversation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (8 hours)

CP 4.1. Developing presentation and career skills: Introduction, Importance of Resume and CV, preparing Resume and CV, Interview Skill Tips, FAQ During Interviews, Mock interviews [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (3 hours)

CP 5.1. Professional values - Integrity, Objectivity, Confidentiality, Professional competence and due care, professional risks, professional responsibility, accountability, professional success [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 6 (3 hours)

CP 6.1. Personal Values - Ethical and Moral values, Attitude and behaviour, Personal Hygiene and Mental Health [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (4 hours)

CP 7.1. Integration, revision, tutorial, structured problem-solving and formative assessment mapped to the course outcomes of this course (RGUHS reconciliation of the prescribed contact hours) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Suggested Readings

1. Graham Lock, Functional English Grammar: Introduction to Second Language Teachers. Cambridge University Press, New York, 1996.
2. Gwen Van Servellen. Communication for Health care professionals: Concepts, practice and evidence, Jones & Bartlett Publications, USA, 2009

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BMLS-105 - Basic Emergency Care and First Aid

Course code	BMLS-105	**Course title**	Basic Emergency Care and First Aid
Hours	Lecture 1 | Tutorial 1 | Practical 0 | Total contact hours 30	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO3, PO5, PO10
Primary competency alignment	PC1, PC11, PC13, PC15	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

Subject Description

Trains the learner, through the DOAP model, to assess emergencies safely, provide first aid for common injuries and poisoning, recognise and manage shock, monitor vital signs and perform Basic Life Support in adult and paediatric victims.

Course rationale (NCAHP): Students will be able to perform basic emergency procedures and provide first aid in everyday medical situations.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BEC-CO1	Assess emergencies quickly and accurately to ensure personal and victim safety.	K/KH	L1-L2 Remember - Understand	PO2, PO3, PO5, PO10 PC1, PC11, PC13, PC15
BEC-CO2	Demonstrate basic life-saving techniques, including CPR (Cardiopulmonary Resuscitation) and the recovery position.	SH	L3 Apply	PO2, PO3, PO5, PO10 PC1, PC11, PC13, PC15

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BEC-CO3	Provide appropriate first aid for common injuries such as wounds, burns, fractures, sprains, and poisoning.	K/KH	L1-L2 Remember - Understand	PO2, PO3, PO5, PO10 PC1, PC11, PC13, PC15
BEC-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO2, PO3, PO5, PO10 PC1, PC11, PC13, PC15
BEC-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO2, PO3, PO5, PO10 PC1, PC11, PC13, PC15

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	First Aid-Introduction, Aims & objectives of first aid, Priorities of first aid, Golden rules of first aid, Qualities & responsibilities of first aider, Simple fi…	10
2	Shock- Definition, Types of shock, General Features of shock, Investigations of shock, Initial management & first aid of shock	4
3	Poisoning- Definition, Causes of poisoning, Sources of Poisoning, Symptoms of poisoning, First aid & Management, Antidotes, Common drugs poisoning, Carbon monoxide po…	4
4	Introduction: Chain of survival, team dynamics & multi-rescuer resuscitation. Vital signs of patients- Body temperature, Pulse, Blood Pressure, Respiration	4
5	Basic Life Support (BLS) in adults: Flowchart approach, approach to victim, techniques of CPR, BLS in paediatric Victims: checking pulse in children, chest compressions t…	8
	Total	**30**

Unit 1 (10 hours)

BEC 1.1. First Aid-Introduction, Aims & objectives of first aid, Priorities of first aid, Golden rules of first aid, Qualities & responsibilities of first aider, Simple first aid measures in selected conditions like Food poisoning, Snake bite, Scorpion bite, Dog bite, foreign bodies in various organs, Burns, Haemorrhage [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (4 hours)

BEC 2.1. Shock- Definition, Types of shock, General Features of shock, Investigations of shock, Initial management & first aid of shock [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive

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lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (4 hours)

BEC 3.1. Poisoning- Definition, Causes of poisoning, Sources of Poisoning, Symptoms of poisoning, First aid & Management, Antidotes, Common drugs poisoning, Carbon monoxide poisoning [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (4 hours)

BEC 4.1. Introduction: Chain of survival, team dynamics & multi-rescuer resuscitation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

BEC 4.2. Vital signs of patients- Body temperature, Pulse, Blood Pressure, Respiration [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (8 hours)

BEC 5.1. Basic Life Support (BLS) in adults: Flowchart approach, approach to victim, techniques of CPR, BLS in paediatric Victims: checking pulse in children, chest compressions techniques, Bag mask ventilation technique [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Suggested Readings

1. Manual of first aid, 1st edition, Gupta Abhitabh, 2012, Jaypee Publishers
2. Emergency medicine, 5th edition, SN Chugh, Ashimachugh 202, CBS publishers.

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BMLS-106 - Basics of Computer Application

Course code	BMLS-106	Course title	Basics of Computer Application
Hours	Lecture 1 | Tutorial 0 | Practical 1 | Total contact hours 45	Credits	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	Primary PO alignment	PO7, PO9, PO10
Primary competency alignment	PC10, PC12, PC16, PC17	Level legend	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

Subject Description

Develops practical competence in computer operations, productivity software, data handling, presentation, networks and internet use, with introductory application to laboratory information systems and health data.

Course rationale (NCAHP): Students will be familiarised with computer operating systems, using Microsoft Office tools, and internet use in healthcare.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BCA-CO1	Identify the basic components and functions of computer hardware and software.	K	L1 Remember	PO7, PO9, PO10 PC10, PC12, PC16, PC17
BCA-CO2	Use word processing software to create, format, and edit professional documents.	KH	L3 Apply	PO7, PO9, PO10 PC10, PC12, PC16, PC17
BCA-CO3	Created and managed spreadsheets with basic formulas and designed presentations.	K/KH	L1-L2 Remember - Understand	PO7, PO9, PO10 PC10, PC12, PC16, PC17

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BCA-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO7, PO9, PO10 PC10, PC12, PC16, PC17
BCA-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO7, PO9, PO10 PC10, PC12, PC16, PC17

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

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Unit 4 (2 hours)

BCA 4.1. Microsoft Excel, Access: Introduction to Excel and Access, Entering data, basic formulas, formatting cells, simple charts [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (2 hours)

BCA 5.1. Internet & Email: Definition, types of network, using browsers, opening email, attaching reports, basic internet safety [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (3 hours)

BCA 6.1. Computers in Healthcare: Electronic health record, Hospital Information System basics, digital patient records, lab reporting usage [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Suggested Readings

1. V. Rajaramana, Computer basics and programming, PHI Learning Pvt. Ltd.
2. Michael Miller, Computer Basics and Absolute Beginner's Guide, Que Publishing SEMESTER II

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BMLS-101 - Human Anatomy Practical

Course code	BMLS-101	**Course title**	Human Anatomy Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO7
Primary competency alignment	PC5, PC9, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-101 with its corresponding theory course, Human Anatomy. Combined course credit for BMLS-101 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner to identify anatomical planes and positions, histological sections of basic tissues and the gross structures of major organ systems on models, specimens, slides and images.

Course rationale (NCAHP): Students will be able to identify and demonstrate anatomical structures of various organ systems. 1. Study of anatomical plans and positions 2. Histological study of tissues 3. Study of Skeletal system 4. Study of respiratory system 5. Study of digestive system 6. Study of urinary system 7. Study of Cardiovascular system 8. Study of Nervous system 9. Study of sensory organs: eye, ear, nose, tongue and skin 10. Study of reproductive system *Clinical laboratory rotation/observation can be incorporated wherever possible

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Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
HAP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the human anatomy laboratory.	SH/P	L3 Apply	PO1, PO2, PO7 PC5, PC9, PC16
HAP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO1, PO2, PO7 PC5, PC9, PC16
HAP-CO3	Perform the prescribed procedures in human anatomy accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO1, PO2, PO7 PC5, PC9, PC16
HAP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO1, PO2, PO7 PC5, PC9, PC16
HAP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO1, PO2, PO7 PC5, PC9, PC16
HAP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO1, PO2, PO7 PC5, PC9, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise

- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

HAP 1. Study of anatomical plans and positions [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HAP 2. Histological study of tissues [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HAP 3. Study of Skeletal system [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HAP 4. Study of respiratory system [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HAP 5. Study of digestive system [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HAP 6. Study of urinary system [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

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HAP 7. Study of Cardiovascular system [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HAP 8. Study of Nervous system [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HAP 9. Study of sensory organs: eye, ear, nose, tongue and skin [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HAP 10. Study of reproductive system [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. Ross and Wilson – Anatomy and Physiology in Health and Illness, 11th Ed., Elsevier
2. Chaurasia B.D. – Human Anatomy, 7th Ed., CBS Publishers
3. Gerard J. Tortora & Bryan H. Derrickson – Principles of Anatomy and Physiology, 14th Ed., Wiley
4. Frank H. Netter – Atlas of Human Anatomy, 7th Ed., Elsevier
5. Frederic H. Martini et al. – Fundamentals of Anatomy and Physiology, 9th Ed., Pearson
6. Gray's Atlas of Anatomy – Richard Drake, Elsevier
7. Manju Chugani & Preysi Chauhan – Simplified Anatomy and Physiology for Paramedical Students, Jaypee

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BMLS-102 - Human Physiology Practical

Course code	BMLS-102	**Course title**	Human Physiology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO7
Primary competency alignment	PC1, PC4, PC5, PC9	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-102 with its corresponding theory course, Human Physiology. Combined course credit for BMLS-102 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in basic physiological measurement and haematological procedures, including microscopy, blood cell counts, haemoglobin estimation, blood grouping, bleeding and clotting time and the recording of vital parameters.

Course rationale (NCAHP): Students will develop an understanding of the normal functioning of human organ systems and explain their physiological processes. 1. Perform blood collection 2. Estimation of Hemoglobin 3. Demonstrate blood cell count – RBC count and WBC count 4. Prepare blood smear and staining 5. Measure Blood pressure and Pulse Rate 6. Demonstration of ECG 7. Demonstration of EMG 8. Perform Reflexes testing 9. Spirometry and PFT (Pulmonary function test) *Clinical laboratory rotation/observation can be incorporated wherever possible

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Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
HPP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the human physiology laboratory.	SH/P	L3 Apply	PO1, PO2, PO7 PC1, PC4, PC5, PC9
HPP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO1, PO2, PO7 PC1, PC4, PC5, PC9
HPP-CO3	Perform the prescribed procedures in human physiology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO1, PO2, PO7 PC1, PC4, PC5, PC9
HPP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO1, PO2, PO7 PC1, PC4, PC5, PC9
HPP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO1, PO2, PO7 PC1, PC4, PC5, PC9
HPP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO1, PO2, PO7 PC1, PC4, PC5, PC9

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

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Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

HPP 1. Perform blood collection [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HPP 2. Estimation of Hemoglobin [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HPP 3. Demonstrate blood cell count – RBC count and WBC count [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HPP 4. Prepare blood smear and staining [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HPP 5. Measure Blood pressure and Pulse Rate [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HPP 6. Demonstration of ECG [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HPP 7. Demonstration of EMG [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

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HPP 8. Perform Reflexes testing [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

HPP 9. Spirometry and PFT (Pulmonary function test) [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. Guyton & Hall – Textbook of Medical Physiology, Elsevier
2. C.C. Chatterjee – Human Physiology, Medical Allied Agency
3. K. Sembulingam – Essentials of Medical Physiology, Jaypee
4. Gerard J. Tortora & Bryan H. Derrickson – Principles of Anatomy and Physiology, 14th Ed., Wiley
5. Ross and Wilson – Anatomy and Physiology in Health and Illness, 11th Ed., Elsevier

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Semester II - Course Structure, Hours and Credits

Sl. No.	Course	Lecture	Tutorial	Practical	Credits	Contact hours
1	BMLS-201 Fundamentals of Microbiology	4	0	4	6	120
2	BMLS-202 Basics of Biochemistry	4	0	4	6	120
3	BMLS-203 Fundamentals of Haematology	4	0	4	6	120
4	BMLS-204 Preventive and Social Medicine	2	0	0	2	30
	Grand Total	**14**	**0**	**12**	**20**	**390**

 # Non-University examination subject (NUES), conducted at the institution level as prescribed by the RGUHS Board of Studies. Prescribed semester totals: 390 contact hours and 20 credits.

Semester II - Examination Scheme

Course	Continuous (internal) assessment	End-semester examination	Total	Status
BMLS-201 Fundamentals of Microbiology	30	70	100	University
BMLS-202 Basics of Biochemistry	30	70	100	University
BMLS-203 Fundamentals of Haematology	30	70	100	University
BMLS-204 Preventive and Social Medicine	30	70	100	University
BMLS-201 Fundamentals of Microbiology Practical	30	70	100	University
BMLS-202 Basics of Biochemistry Practical	30	70	100	University
BMLS-203 Fundamentals of Haematology Practical	30	70	100	University
Grand Total	**210**	**490**	**700**	

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Semester II - Course-to-Competency Overview

Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-201 Fundamentals of Microbiology	Introduces the history and scope of microbiology, microscopy, bacterial morphology, staining, physiology and genetics, sterilisation and disinfection, culture media and methods, identification systems, antimicrobial susceptibility testing and normal human microbial flora.	PO1, PO2, PO6, PO7	PC3, PC5, PC7, PC11, PC16
BMLS-202 Basics of Biochemistry	Introduces laboratory units and solution preparation, acids, bases and buffers, biophysical phenomena, and the chemistry and biological importance of carbohydrates, lipids, amino acids and proteins, nucleic acids, enzymes, vitamins, minerals and nutrition.	PO1, PO2, PO6, PO7	PC3, PC5, PC9, PC16
BMLS-203 Fundamentals of Haematology	Introduces the composition and functions of blood, haematopoiesis, anticoagulants and specimen requirements, routine haematological procedures, normal blood cell morphology and the principles of automated cell counting and haemostasis.	PO1, PO2, PO6, PO7	PC1, PC3, PC5, PC7, PC9
BMLS-204 Preventive and Social Medicine	Develops understanding of basic epidemiology, primary health care and national health programmes, demography and family welfare, environmental health and biomedical waste rules, health education and communication, and the care of patients with communicable diseases.	PO3, PO4, PO5, PO10	PC11, PC13, PC15
BMLS-201 Fundamentals of Microbiology Practical	Trains the learner in laboratory biosafety, microscopy, preparation and sterilisation of media, staining techniques, culture methods, colony characterisation and basic biochemical identification.	PO2, PO6, PO7	PC3, PC4, PC5, PC7, PC11

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Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-202 Basics of Biochemistry Practical	Trains the learner in laboratory apparatus and glassware handling, balance and micropipette use, reagent preparation, water purity, pH and buffer preparation and the qualitative analysis of carbohydrates, proteins and lipids.	PO2, PO6, PO7	PC3, PC4, PC5, PC6
BMLS-203 Fundamentals of Haematology Practical	Trains the learner in phlebotomy, anticoagulant use, haemoglobin estimation, cell counts, PCV, indices, ESR, reticulocyte count, peripheral smear preparation and staining and the operation of automated cell counters.	PO2, PO6, PO7	PC1, PC4, PC5, PC7, PC9

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BMLS-201 - Fundamentals of Microbiology

Course code	BMLS-201	**Course title**	Fundamentals of Microbiology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC3, PC5, PC7, PC11, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-201 with its corresponding practical course, Fundamentals of Microbiology Practical. Combined course credit for BMLS-201 is 6 (Theory 4 + Practical 2).

Subject Description

Introduces the history and scope of microbiology, microscopy, bacterial morphology, staining, physiology and genetics, sterilisation and disinfection, culture media and methods, identification systems, antimicrobial susceptibility testing and normal human microbial flora.

Course rationale (NCAHP): Students will acquire knowledge on the Historical Development of Microbiology, various types of microscopes, bacterial anatomy and staining methods, sterilisation methods, culture media, culture methods, biochemical tests and antibiotic susceptibility tests, and understand the underlying concepts of bacterial genetics and its applications in recombinant DNA technology.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
FM-CO1	Comprehend knowledge of Microscopes, their types and applications.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC3, PC5, PC7, PC11, PC16

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
FM-CO2	Explain microbial structure, physiology, growth, and reproduction.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC3, PC5, PC7, PC11, PC16
FM-CO3	Identify common methods used in the control and prevention of microbial growth and infection.	K	L1 Remember	PO1, PO2, PO6, PO7 PC3, PC5, PC7, PC11, PC16
FM-CO4	Demonstrate knowledge of aseptic techniques and basic microbiological laboratory procedures.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC3, PC5, PC7, PC11, PC16
FM-CO5	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC3, PC5, PC7, PC11, PC16
FM-CO6	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC3, PC5, PC7, PC11, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions

- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Historical Development of Microbiology: Infection and Contagion, Discovery of Microorganisms, Conflict over Spontaneous Generation, Role of Microorganisms in Diseases, Sc…	3
2	Microscopy: Light Microscopy, Bright-field microscopy, Dark- ground microscopy, Phase-contrast microscopy, Fluorescence microscopy, Electron microscopy	7
3	Morphology of Bacteria: Comparison of Prokaryotic Cells– Eukaryotic cells, size of bacteria, arrangement of bacterial cells, Anatomy of the bacterial cell- the structure,…	7
4	Physiology of Bacteria: generation time of bacteria, bacterial growth curve, bacterial nutrition, bacterial metabolism	6
5	Bacterial Genetics: Different gene transfer methods: Transformation, Transduction, Lysogenic conversion, Conjugation	5
6	Sterilisation and Disinfection: Classify sterilisation methods - Dry heat sterilisation, Moist heat sterilisation, Radiation, Filtration. Disinfection- Classify disinfect…	7
7	Culture Media and Methods: Culture Media- common ingredients of culture media, classification of media. Culture Methods- Methods of bacterial culture, aerobic culture, an…	5
8	Identification of Bacteria: Methods used to identify bacteria, phenotypic characteristics, genomic characterisation, Bacterial Taxonomy- Taxonomy, Identification, classifi…	8
9	Antibiotic susceptibility testing (AST): A. Diffusion methods 1. Kirby–Bauer disk diffusion method 2. Stokes disk diffusion method B. Dilution methods 1. Broth dilution m…	6
10	Human Normal Microbial Flora and Microbiome: Microbial Infections- Microorganisms and Host, Infection and Infectious Disease, Classification of Infections, Sources and Mo…	6

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Unit	Topic	Hours
	Total	**60**

Unit 1 (3 hours)

FM 1.1. Historical Development of Microbiology: Infection and Contagion, Discovery of Microorganisms, Conflict over Spontaneous Generation, Role of Microorganisms in Diseases, Scientific Development of Microbiology - Louis Pasteur, Joseph Lister, Robert Koch, Paul Ehrlich, Edward Jenner, Ignaz Semmelweis, Antony van Leeuwenhoek [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (7 hours)

FM 2.1. Microscopy: Light Microscopy, Bright-field microscopy, Dark- ground microscopy, Phase-contrast microscopy, Fluorescence microscopy, Electron microscopy [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (7 hours)

FM 3.1. Morphology of Bacteria: Comparison of Prokaryotic Cells– Eukaryotic cells, size of bacteria, arrangement of bacterial cells, Anatomy of the bacterial cell- the structure, function, and clinical significance of - Cell wall, Cell membrane, Cell surface appendages, Bacterial Capsule, Cell organelles, plasmid, Spore [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FM 3.2. Principles of staining - Simple staining, Negative staining, Differential staining, Gram's and acid-fast staining, Albert's, Flagella staining, Capsule staining, Endospore staining [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (6 hours)

FM 4.1. Physiology of Bacteria: generation time of bacteria, bacterial growth curve, bacterial nutrition, bacterial metabolism [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 5 (5 hours)

FM 5.1. Bacterial Genetics: Different gene transfer methods: Transformation, Transduction, Lysogenic conversion, Conjugation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (7 hours)

FM 6.1. Sterilisation and Disinfection: Classify sterilisation methods - Dry heat sterilisation, Moist heat sterilisation, Radiation, Filtration [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FM 6.2. Disinfection- Classify disinfectants, general features of disinfectants - Alcohols and aldehydes, Dyes, halogens and phenols - Gases, surface active agents and metallic salts, Testing of disinfectants - Rideal Walker method, Chick Martin test, Disinfectant kill time test, Kelsey- Sykes test, In-use test, Advanced techniques in Sterilisation of Heat- Sensitive Articles [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (5 hours)

FM 7.1. Culture Media and Methods: Culture Media- common ingredients of culture media, classification of media [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FM 7.2. Culture Methods- Methods of bacterial culture, aerobic culture, anaerobic culture, methods of anaerobiosis, methods of isolating pure cultures [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 8 (8 hours)

FM 8.1. Identification of Bacteria: Methods used to identify bacteria, phenotypic characteristics, genomic characterisation, Bacterial Taxonomy- Taxonomy, Identification, classification systems, Identification of Bacteria by biochemical tests and automated systems: - Bac T alert and BACTEC systems, -VITEK and Phoenix systems - RTPCR, MALDI-TOF [Competency: K | Revised Bloom: L1 (Remember) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 9 (6 hours)

FM 9.1. Antibiotic susceptibility testing (AST): A. Diffusion methods 1. Kirby–Bauer disk diffusion method 2 [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FM 9.2. Stokes disk diffusion method B. Dilution methods 1. Broth dilution method 2. Agar dilution method [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FM 9.3. Epsilometer or E-test, Minimum inhibitory concentration (MIC) and Minimum bactericidal concentration (MBC) of antibiotics [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 10 (6 hours)

FM 10.1. Human Normal Microbial Flora and Microbiome: Microbial Infections- Microorganisms and Host, Infection and Infectious Disease, Classification of Infections, Sources and Modes of Transmission of Infection, Epidemiological Terminologies [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-202 - Basics of Biochemistry

Course code	BMLS-202	**Course title**	Basics of Biochemistry
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC3, PC5, PC9, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-202 with its corresponding practical course, Basics of Biochemistry Practical. Combined course credit for BMLS-202 is 6 (Theory 4 + Practical 2).

Subject Description

Introduces laboratory units and solution preparation, acids, bases and buffers, biophysical phenomena, and the chemistry and biological importance of carbohydrates, lipids, amino acids and proteins, nucleic acids, enzymes, vitamins, minerals and nutrition.

Course rationale (NCAHP): Students will learn the basic concepts of Biochemistry, chemistry of carbohydrates, proteins, lipids, nucleic acids, enzymes, vitamins, minerals and nutritional requirements.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BB-CO1	Describe the structure and function of key biomolecules, including carbohydrates, proteins, lipids, and nucleic acids.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC3, PC5, PC9, PC16
BB-CO2	Explain the fundamental principles of enzyme action, including enzyme kinetics, inhibition, and regulation.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC3, PC5, PC9, PC16

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BB-CO3	Demonstrate knowledge of biochemical techniques used to analyse biomolecules.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC3, PC5, PC9, PC16
BB-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC3, PC5, PC9, PC16
BB-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC3, PC5, PC9, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Introduction to Biochemistry: Units of weight and volume, Preparation of solutions (percentage, Molarity, Normality), Basic concepts of acids, bases, and buffers, their a…	4
2	Chemistry of Carbohydrates: Introduction to carbohydrates, biological importance of carbohydrates, classification, physical and chemical properties	7
3	Chemistry of lipids: Introduction to lipids, biological importance of lipids, Classification of lipids, Physical and chemical properties, Cholesterol and lipoproteins	7
4	Chemistry of Amino acids & Proteins: Introduction to amino acids, biological importance of Amino acids, classification of amino acids. Introduction to proteins, the b…	10
5	Chemistry of Nucleic acids: Introduction to Nucleic acids, nucleotides, nucleosides, biological importance of Nucleic acids, Structure of DNA and RNA, Difference between …	8
6	Chemistry of Enzymes: Introduction of enzymes, classification of enzymes, Coenzymes and Cofactors, Active site, Mechanism of action, Factors influencing enzyme action, En…	8
7	Vitamins & Minerals: Introduction to vitamins, Classification, RDA, Chemistry and biochemical function, deficiencies and toxic manifestations Introduction to minerals…	12
8	Nutrition: Calorie Requirements, SDA and BMR, Respiratory Quotient, Glycemic Index, Balanced Diet and Energy Calculations, Formulation of diet and dietary fibre, Starvati…	4
	Total	**60**

Unit 1 (4 hours)

BB 1.1. Introduction to Biochemistry: Units of weight and volume, Preparation of solutions (percentage, Molarity, Normality), Basic concepts of acids, bases, and buffers, their application in the Laboratory [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive

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lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

BB 1.2. Definition and determination of pH. Preparation of distilled water, double-distilled water, and deionised water [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

BB 1.3. Fundamental concepts on biophysical phenomena like osmosis, dialysis, colloidal state, viscosity, adsorption, osmotic pressure, and surface tension [Competency: KH | Revised Bloom: L2 (Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (7 hours)

BB 2.1. Chemistry of Carbohydrates: Introduction to carbohydrates, biological importance of carbohydrates, classification, physical and chemical properties [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (7 hours)

BB 3.1. Chemistry of lipids: Introduction to lipids, biological importance of lipids, Classification of lipids, Physical and chemical properties, Cholesterol and lipoproteins [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (10 hours)

BB 4.1. Chemistry of Amino acids & Proteins: Introduction to amino acids, biological importance of Amino acids, classification of amino acids [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

BB 4.2. Introduction to proteins, the biological importance of proteins [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

BB 4.3. Classification of proteins, Structural organisation of Proteins, Physical and chemical properties of Proteins and Amino acids [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive

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lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (8 hours)

BB 5.1. Chemistry of Nucleic acids: Introduction to Nucleic acids, nucleotides, nucleosides, biological importance of Nucleic acids, Structure of DNA and RNA, Difference between DNA and RNA [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (8 hours)

BB 6.1. Chemistry of Enzymes: Introduction of enzymes, classification of enzymes, Coenzymes and Cofactors, Active site, Mechanism of action, Factors influencing enzyme action, Enzyme inhibition and regulation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (12 hours)

BB 7.1. Vitamins & Minerals: Introduction to vitamins, Classification, RDA, Chemistry and biochemical function, deficiencies and toxic manifestations Introduction to minerals, Classification, RDA, Chemistry and biochemical function, deficiencies and toxic manifestations, Special references to calcium, phosphorus, magnesium, iron, zinc and copper [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 8 (4 hours)

BB 8.1. Nutrition: Calorie Requirements, SDA and BMR, Respiratory Quotient, Glycemic Index, Balanced Diet and Energy Calculations, Formulation of diet and dietary fibre, Starvation, obesity, and Protein Energy Malnutrition [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-203 - Fundamentals of Haematology

Course code	BMLS-203	**Course title**	Fundamentals of Haematology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC1, PC3, PC5, PC7, PC9	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-203 with its corresponding practical course, Fundamentals of Haematology Practical. Combined course credit for BMLS-203 is 6 (Theory 4 + Practical 2).

Subject Description

Introduces the composition and functions of blood, haematopoiesis, anticoagulants and specimen requirements, routine haematological procedures, normal blood cell morphology and the principles of automated cell counting and haemostasis.

Course rationale (NCAHP): Students will be made aware of the composition of blood and methods of estimating different components of blood. Students will learn the basic concepts of Hematology and routine clinical investigations of the Haematology laboratory.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
FH-CO1	Understand the composition of blood and the function of blood cells.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC1, PC3, PC5, PC7, PC9

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
FH-CO2	Identify the normal and abnormal blood cells \, viz erythrocytes, leucocytes and thrombocytes.	K	L1 Remember	PO1, PO2, PO6, PO7 PC1, PC3, PC5, PC7, PC9
FH-CO3	Comprehend the process of hemostasis and its physiological properties.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC1, PC3, PC5, PC7, PC9
FH-CO4	Demonstrate knowledge of haematological techniques used to analyse basic parameters in the Laboratory.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC1, PC3, PC5, PC7, PC9
FH-CO5	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC1, PC3, PC5, PC7, PC9
FH-CO6	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC1, PC3, PC5, PC7, PC9

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

eaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay

- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Introduction to blood, composition and function of normal cellular components. Haematopoiesis: Site of haematopoiesis, Bone marrow and Bone marrow collection; Cellular ra…	10
2	Erythrocytes: Normal Structure, Function, and Fate of Erythrocytes along with Clinical Indications of Jaundice, Normal Range. Abnormal Red Blood Cells: Anisocytes, Poikil…	10
3	Leucocytes: Structure, functions, normal range, lifespan of normal White Blood Cells. Quantitative and qualitative disorders of White Blood Cells: physiological and patho…	10
4	Thrombocytes: Structure, functions, normal range, lifespan of normal Platelets. Quantitative disorder of Platelets: physiological and pathological causes Normal hemostasi…	10
5	Hematocrit and Erythrocyte Sedimentation Rate: physiological and pathological causes	5
6	Automation in Haematology lab: principles and analysis Quality assurance in Haematology, Internal and external quality control, including reference preparation, Routine q…	8
7	Anticoagulants: types, mode of action and preference of anticoagulants for different haematological studies. Different types of blood collection, including the preservati…	7
	Total	**60**

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Unit 1 (10 hours)

FH 1.1. Introduction to blood, composition and function of normal cellular components [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FH 1.2. Haematopoiesis: Site of haematopoiesis, Bone marrow and Bone marrow collection; Cellular ratio, bone marrow biopsy and aspiration techniques and their indications for collection [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (10 hours)

FH 2.1. Erythrocytes: Normal Structure, Function, and Fate of Erythrocytes along with Clinical Indications of Jaundice, Normal Range [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FH 2.2. Abnormal Red Blood Cells: Anisocytes, Poikilocytes, and their clinical significance Hemoglobin: Structure, composition and function, synthesis and regulation of hemoglobin, oxygen association and dissociation curve Various types of hemoglobin with clinical significance - Fetal hemoglobin, Meth-hemoglobin, Sulf-haemoglobin, Carboxyhemoglobin, Sickle hemoglobin, Glycosylated hemoglobin, different methods of estimation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (10 hours)

FH 3.1. Leucocytes: Structure, functions, normal range, lifespan of normal White Blood Cells [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FH 3.2. Quantitative and qualitative disorders of White Blood Cells: physiological and pathological causes [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (10 hours)

FH 4.1. Thrombocytes: Structure, functions, normal range, lifespan of normal Platelets [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) |

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Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FH 4.2. Quantitative disorder of Platelets: physiological and pathological causes Normal hemostasis and physiological properties of coagulation factors [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FH 4.3. Primary, secondary and tertiary hemostasis. Role of the platelets, coagulation factors, coagulation inhibitory system and fibrinolysis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (5 hours)

FH 5.1. Hematocrit and Erythrocyte Sedimentation Rate: physiological and pathological causes [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (8 hours)

FH 6.1. Automation in Haematology lab: principles and analysis Quality assurance in Haematology, Internal and external quality control, including reference preparation, Routine quality assurance protocol, Statistical analysis, i.e [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FH 6.2. Standard deviation, Coefficient of variation, accuracy and precision [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (7 hours)

FH 7.1. Anticoagulants: types, mode of action and preference of anticoagulants for different haematological studies [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

FH 7.2. Different types of blood collection, including the preservation of blood samples for various haematological investigations [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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FH 7.3. Principles of Romonowsky stain with examples and its applications [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-204 - Preventive and Social Medicine

Course code	BMLS-204	**Course title**	Preventive and Social Medicine
Hours	Lecture 2 | Tutorial 0 | Practical 0 | Total contact hours 30	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO3, PO4, PO5, PO10
Primary competency alignment	PC11, PC13, PC15	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

Subject Description

Develops understanding of basic epidemiology, primary health care and national health programmes, demography and family welfare, environmental health and biomedical waste rules, health education and communication, and the care of patients with communicable diseases.

Course rationale (NCAHP): Through this course, students learn the principles of primary health care, the significance of health programs, and the role of communication and education in behaviour change. The inclusion of first aid and patient care in communicable diseases prepares allied health professionals to actively contribute to health promotion and disease prevention at all levels of healthcare delivery.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
PSM-CO1	Describe the epidemiology, prevention, and control of communicable and non-communicable diseases.	KH	L2 Understand	PO3, PO4, PO5, PO10 PC11, PC13, PC15
PSM-CO2	Understand the concepts and principles of public health, disease prevention, and health promotion.	KH	L2 Understand	PO3, PO4, PO5, PO10 PC11, PC13, PC15

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
PSM-CO3	Identify the determinants of health and disease, including environmental, social, economic, and behavioural factors.	K	L1 Remember	PO3, PO4, PO5, PO10 PC11, PC13, PC15
PSM-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO3, PO4, PO5, PO10 PC11, PC13, PC15
PSM-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO3, PO4, PO5, PO10 PC11, PC13, PC15

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Basic Epidemiology: Epidemiological Triad, Carrier, Reservoir, Host for infection and diseases, Various methods of disinfection used at each level of healthcare, Incubati…	3
2	Primary Health Care: Principles, Elements, Health Programmes - Maternal and Child Health, Nutrition, Environment, older adults, Central Government Health Schemes, Occupat…	7
3	Demography and Family Welfare: Definition, Demographic cycle, Population Explosion, Factors influencing population growth, death rate, birth rate, and methods of contrace…	3
4	Environmental Health: Air Pollution, Noise Pollution, Water Pollution, with the causes, effects, and preventive measures. Solid Waste Management - Swachh Bharat Abhiyan, …	7
5	Communication and Health Education: Health education–definition, principles, objectives, purpose, types, and AV aids. Communication–definition, process, and types. Behavi…	8
6	Patient care in Communicable Diseases: Care of patients with communicable diseases, Isolation methods, Standard safety measures (Universal precautions). Role and skill of…	2
	Total	**30**

Unit 1 (3 hours)

PSM 1.1. Basic Epidemiology: Epidemiological Triad, Carrier, Reservoir, Host for infection and diseases, Various methods of disinfection used at each level of healthcare, Incubation period, Nosocomial Infections [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (7 hours)

PSM 2.1. Primary Health Care: Principles, Elements, Health Programmes - Maternal and Child Health, Nutrition, Environment, older adults, Central Government Health Schemes, Occupational Health, Voluntary Health

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Agencies, Role of NGOs in the Health Team [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (3 hours)

PSM 3.1. Demography and Family Welfare: Definition, Demographic cycle, Population Explosion, Factors influencing population growth, death rate, birth rate, and methods of contraception [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

PSM 3.2. Family Welfare – Definition, Objectives of Family Planning [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

PSM 3.3. Types: Temporary and Permanent methods, Follow-up of contraceptive methods, Family planning counselling [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (7 hours)

PSM 4.1. Environmental Health: Air Pollution, Noise Pollution, Water Pollution, with the causes, effects, and preventive measures [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

PSM 4.2. Solid Waste Management - Swachh Bharat Abhiyan, Nirmal Bharat Abhiyan [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

PSM 4.3. Biomedical Waste Management Rules 2016 - colour coding and disposal into correctly colour-coded bags [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

PSM 4.4. Disease Elimination and Disease Eradication: Examples [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (8 hours)

PSM 5.1. Communication and Health Education: Health education–definition, principles, objectives, purpose, types, and AV aids [Competency: K/KH | Revised

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Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

PSM 5.2. Communication–definition, process, and types. Behavioural change communication [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

PSM 5.3. IEC (Information, education, and communication): aims, scope, concept, and approaches. First-aid–Definition, Principles, Golden rules, and bandages [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

PSM 5.4. First-aid for fracture, bleeding, drowning, Convulsions, Foreign Bodies, poisoning, Shock, and Cardio- Pulmonary Resuscitation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

PSM 5.5. Role and skill of health professional in Health Education; Interpersonal relationship: coordination and cooperation in health education with other members of the health team [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (2 hours)

PSM 6.1. Patient care in Communicable Diseases: Care of patients with communicable diseases, Isolation methods, Standard safety measures (Universal precautions) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

PSM 6.2. Role and skill of the Health professional in the management of patients with communicable diseases [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Suggested Readings

1. Textbook of Preventive and Social Medicine – J.E.Park
2. Manual for Laboratory Technician – 1985. DGHS, Ministry of Health, Govt of India SEMESTER III

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BMLS-201 - Fundamentals of Microbiology Practical

Course code	BMLS-201	**Course title**	Fundamentals of Microbiology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC3, PC4, PC5, PC7, PC11	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-201 with its corresponding theory course, Fundamentals of Microbiology. Combined course credit for BMLS-201 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in laboratory biosafety, microscopy, preparation and sterilisation of media, staining techniques, culture methods, colony characterisation and basic biochemical identification.

Course rationale (NCAHP): Students will acquire knowledge to demonstrate and perform basic microbiological tests in the identification of microorganisms. 1. Demonstrate the collection of various clinical specimens and their transport and processing. 2. Demonstrate a safe code of practice in the Microbiology laboratory 3. Demonstrate cleaning and sterilisation of glassware 4. Perform microscopy and specimen processing 5. Operate the autoclave and hot air oven, including its efficacy testing. 6. Demonstrate the sterilisation of reagents and culture media 7. Demonstrate sterilisation of media/solution by filtration. 8. Demonstrate the proper precautions to take when using disinfectants and dilution of commonly used disinfectants. 9. Demonstrate Simple staining 10. Demonstrate Gram's staining 11. Demonstrate Preparation of stains, reagents and culture media, quality control of reagents and media, and sterility check 12. Identify QC strains used for culture media *Clinical laboratory rotation/observation can be incorporated wherever possible

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Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
FMP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the fundamentals of microbiology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC7, PC11
FMP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC7, PC11
FMP-CO3	Perform the prescribed procedures in fundamentals of microbiology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC7, PC11
FMP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC3, PC4, PC5, PC7, PC11
FMP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC3, PC4, PC5, PC7, PC11
FMP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC7, PC11

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise

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- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

FMP 1. Demonstrate the collection of various clinical specimens and their transport and processing. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FMP 2. Demonstrate a safe code of practice in the Microbiology laboratory [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FMP 3. Demonstrate cleaning and sterilisation of glassware [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FMP 4. Perform microscopy and specimen processing [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FMP 5. Operate the autoclave and hot air oven, including its efficacy testing. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

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FMP 6. Demonstrate the sterilisation of reagents and culture media [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FMP 7. Demonstrate sterilisation of media/solution by filtration. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FMP 8. Demonstrate the proper precautions to take when using disinfectants and dilution of commonly used disinfectants. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FMP 9. Demonstrate Simple staining [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FMP 10. Demonstrate Gram's staining [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FMP 11. Demonstrate Preparation of stains, reagents and culture media, quality control of reagents and media, and sterility check [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FMP 12. Identify QC strains used for culture media [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. Mackie & McCartney – Practical Medical Microbiology, Elsevier
2. Bailey & Scott – Diagnostic Microbiology, Elsevier
3. R. Ananthanarayan & C.K. Jayaram Paniker – Textbook of Microbiology, Universities Press
4. Surinder Kumar – Essentials of Microbiology, Jaypee Brothers Medical Publishers
5. Subhash Chandra Parija – Textbook of Microbiology and Immunology, Elsevier
6. Lansing M. Prescott – Microbiology, McGraw-Hill
7. Apurba Sankar Sastry & Sandhya Bhat K – Essentials in Medical Microbiology, Jaypee Brothers Medical Publishers

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8. Praful B. Godkar & Darshan P. Godkar – Textbook of Medical Laboratory Technology, Bhalani Publishing

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BMLS-202 - Basics of Biochemistry Practical

Course code	BMLS-202	**Course title**	Basics of Biochemistry Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC3, PC4, PC5, PC6	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-202 with its corresponding theory course, Basics of Biochemistry. Combined course credit for BMLS-202 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in laboratory apparatus and glassware handling, balance and micropipette use, reagent preparation, water purity, pH and buffer preparation and the qualitative analysis of carbohydrates, proteins and lipids.

Course rationale (NCAHP): Students will learn the essential laboratory practices, which include the Preparation of Lab reagents and qualitative analysis of carbohydrates, proteins and lipids. 1. Demonstrate the use of Laboratory Apparatus, Micropipettes, and their uses 2. Demonstrate cleaning of glassware 3. Demonstrate the use of a laboratory balance 4. Prepare and label common Laboratory reagents (Percentage, Molarity, Normality) 5. Preparation of distilled water, double-distilled water, and deionised water. 6. Measure pH for laboratory reagents/ biological samples 7. Perform qualitative analysis of carbohydrate and identification of unknown carbohydrate- Molisch test, Benedict test, Modified Bareford test, Seliwanoff test, Bial test, Mucic acid test, Iodine test, Foulger's test, osazone test 8. Perform qualitative analysis of protein and amino acids- Precipitation test - Heat and acetic acid Test, Heller's test, alkali, alcohol, Isoelectric point precipitation. Colour reaction – Ninhydrin, Nitroprusside test, Xanthoproteic

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test, Million test, Sakaguchi test 9. Perform qualitative analysis of lipids – Solubility test *Clinical laboratory rotation/observation can be incorporated wherever possible

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BBP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the basics of biochemistry laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC6
BBP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC6
BBP-CO3	Perform the prescribed procedures in basics of biochemistry accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC6
BBP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC3, PC4, PC5, PC6
BBP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC3, PC4, PC5, PC6
BBP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC6

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study

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- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

BBP 1. Demonstrate the use of Laboratory Apparatus, Micropipettes, and their uses [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BBP 2. Demonstrate cleaning of glassware [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BBP 3. Demonstrate the use of a laboratory balance [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BBP 4. Prepare and label common Laboratory reagents (Percentage, Molarity, Normality) [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BBP 5. Preparation of distilled water, double-distilled water, and deionised water. [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

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BBP 6. Measure pH for laboratory reagents/ biological samples [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BBP 7. Perform qualitative analysis of carbohydrate and identification of unknown carbohydrate- Molisch test, Benedict test, Modified Bareford test, Seliwanoff test, Bial test, Mucic acid test, Iodine test, Foulger's test, osazone test [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BBP 8. Perform qualitative analysis of protein and amino acids- Precipitation test - Heat and acetic acid Test, Heller's test, alkali, alcohol, Isoelectric point precipitation. Colour reaction – Ninhydrin, Nitroprusside test, Xanthoproteic test, Million test, Sakaguchi test [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BBP 9. Perform qualitative analysis of lipids – Solubility test [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. U. Sathyanarayana – Biochemistry, Elsevier
2. Robert K. Murray et al. – Harper's Illustrated Biochemistry, Tata McGraw-Hill
3. M.N. Chatterjee & Rana Shinde – Textbook of Medical Biochemistry, Jaypee
4. Alan Gowenlock – Varley's Practical Clinical Biochemistry, CBS
5. David L. Nelson & Michael M. Cox – Lehninger Principles of Biochemistry, W.H. Freeman
6. D.M. Vasudevan – Textbook of Biochemistry, Jaypee
7. A.C. Deb – Fundamentals of Biochemistry, New Central Book Agency
8. Y.K. Joshi – Basics of Clinical nutrition, Jaypee publishers

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BMLS-203 - Fundamentals of Haematology Practical

Course code	BMLS-203	**Course title**	Fundamentals of Haematology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC1, PC4, PC5, PC7, PC9	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-203 with its corresponding theory course, Fundamentals of Haematology. Combined course credit for BMLS-203 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in phlebotomy, anticoagulant use, haemoglobin estimation, cell counts, PCV, indices, ESR, reticulocyte count, peripheral smear preparation and staining and the operation of automated cell counters.

Course rationale (NCAHP): Students will acquire comprehensive knowledge and skills in fundamental laboratory techniques and patient safety. They will understand and apply knowledge regarding sample collection, transport, storage, and preservation. Perform laboratory investigations using appropriate methods and instruments, while adhering to safety protocols and equipment care. 1. Demonstrate laboratory safety and biomedical waste management 2. Pre-analytical variables in clinical Laboratory: Patient and test request form identification, Patient preparation for phlebotomy, Sources of error in venous blood sample collection 3. Sample transport, processing, Sample acceptance and rejection criteria 4. Perform blood collection and demonstrate the order of draw 5. Estimation of hemoglobin by Drabkin's method 6. Perform Packed Cell Volume 7. Perform ESR by the Westergren method 8. Stain and examine the blood smear using Romanowsky stain 9. Perform Differential Leucocyte Count 10. Perform RBC count 11. Perform

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WBC count 12. Perform Absolute Eosinophil count 13. Perform Platelet count 14. Calculation of Red Cell Indices 15. Perform Bleeding Time and Clotting Time 16. Operate automated cell counters and interpret results 17. Perform Reticulocyte count *Clinical Laboratory rotation/observation can be incorporated wherever possible Suggested books ● Godkar, P. B., & Godkar, D. P. (2006). Textbook of medical laboratory technology. Bhalani publishing house. ● Dacie, J. V. (2006). Dacie and Lewis practical haematology. Elsevier Health Sciences. ● Firkin, F., Chesterman, C., Rush, B., & Pennigton, D. (2008). De Gruchy's Clinical haematology in medical Practice. John Wiley & Sons. ● McPherson, Richard A.. (2022). Henry's clinical diagnosis and management by laboratory methods, 24th ed. (24). : Elsevier. ● M.D., H, T., M.D, H, D. (2004). Color Atlas of Hematology Practical Microscopic and Clinical Diagnosis. New York: Thieme. ● Greer, J. P., Arber, D. A., Glader, B., & List, A. F. (2018). Wintrobe's clinical hematology (14th ed.). Wolters Kluwer. ● Kanai, L Mukherjee, (2010). Medical Laboratory Technology, CBS publishers

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
FHP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the fundamentals of haematology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC1, PC4, PC5, PC7, PC9
FHP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC1, PC4, PC5, PC7, PC9
FHP-CO3	Perform the prescribed procedures in fundamentals of haematology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC1, PC4, PC5, PC7, PC9
FHP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC1, PC4, PC5, PC7, PC9

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
FHP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC1, PC4, PC5, PC7, PC9
FHP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC1, PC4, PC5, PC7, PC9

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

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Prescribed practical exercises

FHP 1. Demonstrate laboratory safety and biomedical waste management [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 2. Pre-analytical variables in clinical Laboratory: Patient and test request form identification, Patient preparation for phlebotomy, Sources of error in venous blood sample collection [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 3. Sample transport, processing, Sample acceptance and rejection criteria [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 4. Perform blood collection and demonstrate the order of draw [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 5. Estimation of hemoglobin by Drabkin's method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 6. Perform Packed Cell Volume [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 7. Perform ESR by the Westergren method [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 8. Stain and examine the blood smear using Romanowsky stain [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 9. Perform Differential Leucocyte Count [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 10. Perform RBC count [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 11. Perform WBC count [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

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FHP 12. Perform Absolute Eosinophil count [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 13. Perform Platelet count [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 14. Calculation of Red Cell Indices [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 15. Perform Bleeding Time and Clotting Time [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 16. Operate automated cell counters and interpret results [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

FHP 17. Perform Reticulocyte count [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

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First Year Mapping Annexure 1
Course-to-Programme-Outcome Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
BMLS-101 Human Anatomy	✓	✓				✓	✓				✓		
BMLS-102 Human Physiology	✓	✓				✓	✓				✓		
BMLS-103 Fundamentals of the Healthcare System and Medical Laboratory Science	✓		✓	✓	✓					✓			
BMLS-104 Communication and Professionalism				✓	✓		✓			✓		✓	
BMLS-105 Basic Emergency Care and First Aid		✓	✓		✓					✓			
BMLS-106 Basics of Computer Application							✓		✓	✓		✓	
BMLS-101 Human Anatomy Practical	✓	✓					✓				✓		
BMLS-102 Human Physiology Practical	✓	✓					✓				✓		
BMLS-201 Fundamentals of Microbiology	✓	✓				✓	✓				✓		✓
BMLS-202 Basics of Biochemistry	✓	✓				✓	✓				✓		
BMLS-203 Fundamentals of Haematology	✓	✓				✓	✓				✓		✓
BMLS-204 Preventive and Social Medicine			✓	✓	✓					✓			
BMLS-201 Fundamentals of Microbiology Practical		✓				✓	✓				✓		✓
BMLS-202 Basics of Biochemistry Practical		✓				✓	✓				✓		
BMLS-203 Fundamentals of Haematology Practical		✓				✓	✓				✓		✓

A tick indicates the primary developmental contribution of the course to that outcome. It does not restrict the universal applicability of PO1-PO10 and PSO1-PSO3 across the programme.

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First Year Mapping Annexure 2 – Professional-Competency Contribution

Course	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9	PC 10	PC 11	PC 12	PC 13	PC 14	PC 15	PC 16	PC 17	PC 18
BMLS-101 Human Anatomy	✓				✓				✓							✓		
BMLS-102 Human Physiology					✓				✓				✓			✓		
BMLS-103 Fundamentals of the Healthcare System and Medical Laboratory Science								✓			✓	✓		✓	✓			
BMLS-104 Communication and Professionalism										✓			✓	✓	✓			✓
BMLS-105 Basic Emergency Care and First Aid	✓										✓		✓		✓			
BMLS-106 Basics of Computer Application										✓		✓				✓	✓	
BMLS-101 Human Anatomy Practical					✓				✓							✓		
BMLS-102 Human Physiology Practical	✓			✓	✓				✓									
BMLS-201 Fundamentals of Microbiology			✓		✓		✓				✓					✓		
BMLS-202 Basics of Biochemistry			✓		✓				✓							✓		
BMLS-203 Fundamentals of Haematology	✓		✓		✓		✓		✓									
BMLS-204 Preventive and Social Medicine											✓		✓		✓			
BMLS-201 Fundamentals of Microbiology Practical			✓	✓	✓		✓				✓							
BMLS-202 Basics of Biochemistry Practical			✓	✓	✓	✓												
BMLS-203 Fundamentals of Haematology Practical	✓			✓	✓		✓		✓									

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Part II - Second-Year BMLS (Semesters III and IV)

Systematic bacteriology, metabolism and endocrinology, clinical haematology, pharmacology, virology and immunology, genetics and molecular biology, clinical pathology and laboratory quality management.

Semester III - Course Structure, Hours and Credits

Sl. No.	Course	Lecture	Tutorial	Practical	Credits	Contact hours
1	BMLS-301 Bacteriology	4	0	4	6	120
2	BMLS-302 Intermediary Metabolism and Endocrinology	4	0	4	6	120
3	BMLS-303 Clinical Haematology	4	0	4	6	120
4	BMLS-304 Basics of Pharmacology	2	0	0	2	30
	Grand Total	**14**	**0**	**12**	**20**	**390**

 # Non-University examination subject (NUES), conducted at the institution level as prescribed by the RGUHS Board of Studies. Prescribed semester totals: 390 contact hours and 20 credits.

Semester III - Examination Scheme

Course	Continuous (internal) assessment	End-semester examination	Total	Status
BMLS-301 Bacteriology	30	70	100	University
BMLS-302 Intermediary Metabolism and Endocrinology	30	70	100	University
BMLS-303 Clinical Haematology	30	70	100	University
BMLS-304 Basics of Pharmacology	30	70	100	University
BMLS-301 Bacteriology Practical	30	70	100	University
BMLS-302 Intermediary Metabolism and Endocrinology Practical	30	70	100	University
BMLS-303 Clinical Haematology Practical	30	70	100	University

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Course	Continuous (internal) assessment	End-semester examination	Total	Status
Grand Total	**210**	**490**	**700**	

Semester III - Course-to-Competency Overview

Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-301 Bacteriology	Develops systematic knowledge of medically important Gram-positive and Gram-negative bacteria, mycobacteria, anaerobes and spirochaetes, their pathogenesis, specimen requirements, laboratory diagnosis and clinically relevant antimicrobial considerations.	PO1, PO2, PO6, PO7	PC2, PC5, PC9, PC11, PC16
BMLS-302 Intermediary Metabolism and Endocrinology	Develops understanding of the metabolism of carbohydrates, lipids, proteins, amino acids, purines, pyrimidines and haemoglobin, biological oxidation, integration of metabolism, mineral and water-electrolyte balance and the endocrine system.	PO1, PO2, PO6, PO7	PC5, PC9, PC16
BMLS-303 Clinical Haematology	Develops understanding of anaemias, haemoglobinopathies, haemolytic disorders, leucocyte and platelet disorders, leukaemias, lymphomas, bone-marrow examination and disorders of haemostasis, with their laboratory diagnosis and interpretation.	PO1, PO2, PO6, PO7	PC5, PC7, PC9, PC10
BMLS-304 Basics of Pharmacology	Introduces general pharmacology, routes of administration, pharmacokinetics and pharmacodynamics, adverse drug reactions, antimicrobial chemotherapy, drugs used in hormonal and metabolic disorders and drugs acting on blood, with relevance to laboratory interpretation and therapeutic drug monitoring.	PO1, PO6, PO7, PO10	PC5, PC9, PC16

Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-301 Bacteriology Practical	Trains the learner in specimen processing, culture and isolation, staining, biochemical identification, antimicrobial susceptibility testing and quality control of media and strains.	PO2, PO6, PO7	PC2, PC3, PC5, PC7, PC11
BMLS-302 Intermediary Metabolism and Endocrinology Practical	Trains the learner in colorimetry and photometry, estimation of glucose, urea, creatinine, protein, lipids, bilirubin and electrolytes, glucose tolerance testing and the interpretation of metabolic and endocrine profiles.	PO2, PO6, PO7	PC3, PC4, PC5, PC6, PC9
BMLS-303 Clinical Haematology Practical	Trains the learner in peripheral smear examination, reticulocyte count, bone-marrow smear staining, haemoglobin variant and thalassaemia testing, osmotic fragility, sickling test and first-line haemostasis testing with clinical correlation.	PO2, PO6, PO7	PC5, PC7, PC9, PC10

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BMLS-301 - Bacteriology

Course code	BMLS-301	**Course title**	Bacteriology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC2, PC5, PC9, PC11, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-301 with its corresponding practical course, Bacteriology Practical. Combined course credit for BMLS-301 is 6 (Theory 4 + Practical 2).

Subject Description

Develops systematic knowledge of medically important Gram-positive and Gram-negative bacteria, mycobacteria, anaerobes and spirochaetes, their pathogenesis, specimen requirements, laboratory diagnosis and clinically relevant antimicrobial considerations.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BAC-CO1	Identify clinically significant bacteria that cause human disease.	K	L1 Remember	PO1, PO2, PO6, PO7 PC2, PC5, PC9, PC11, PC16
BAC-CO2	Describe the pathogenesis, clinical features, and modes of transmission of common infectious diseases.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC2, PC5, PC9, PC11, PC16
BAC-CO3	Demonstrate proper techniques for specimen collection, handling, and processing in a clinical bacteriology laboratory.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC2, PC5, PC9, PC11, PC16

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BAC-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC2, PC5, PC9, PC11, PC16
BAC-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC2, PC5, PC9, PC11, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may

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select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Gram-positive bacteria: Staphylococcus species, Streptococcus species, Corynebacterium diphtheriae, Bacillus species	8
2	Mycobacteria: Classification and morphology	4
3	Anaerobes: Non-spore-forming anaerobes. Classify anaerobes, infections caused, and laboratory diagnosis of non-sporing anaerobes	5
4	Spore-forming anaerobes: Classify Clostridia species: Clostridium perfringens, Clostridium tetani, Clostridium botulinum, Clostridium difficile	5
5	Gram Negative Cocci: Neisseria meningitidis, Neisseria gonorrhoeae	5
6	Enterobacteriaceae: Escherichia coli, Klebsiella species, Proteus species, Salmonella species, Shigella species	10
7	Vibrio species, Pseudomonas and Burkholderia. Spirochetes: Classification of Spirochetes - Treponema pallidum, Leptospira, Borrelia	8
8	Mycoplasma, Actinomycetes and Nocardia, Candida	5
9	Types of infections & diagnosis - Skin and soft tissue infections, Respiratory tract infections, Cardiovascular System & Central Nervous System infections, Otitis…	6
10	Nosocomial Infection - Hospital Acquired Infections (HAI), risk factors, sources and route. Investigation, prevention and control of hospital-acquired infections. Bacteri…	4
	Total	**60**

Unit 1 (8 hours)

BAC 1.1. Gram-positive bacteria: Staphylococcus species, Streptococcus species, Corynebacterium diphtheriae, Bacillus species [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (4 hours)

BAC 2.1. Mycobacteria: Classification and morphology [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 3 (5 hours)

BAC 3.1. Anaerobes: Non-spore-forming anaerobes. Classify anaerobes, infections caused, and laboratory diagnosis of non-sporing anaerobes [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (5 hours)

BAC 4.1. Spore-forming anaerobes: Classify Clostridia species: Clostridium perfringens, Clostridium tetani, Clostridium botulinum, Clostridium difficile [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (5 hours)

BAC 5.1. Gram Negative Cocci: Neisseria meningitidis, Neisseria gonorrhoeae [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (10 hours)

BAC 6.1. Enterobacteriaceae: Escherichia coli, Klebsiella species, Proteus species, Salmonella species, Shigella species [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (8 hours)

BAC 7.1. Vibrio species, Pseudomonas and Burkholderia. Spirochetes: Classification of Spirochetes - Treponema pallidum, Leptospira, Borrelia [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 8 (5 hours)

BAC 8.1. Mycoplasma, Actinomycetes and Nocardia, Candida [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 9 (6 hours)

BAC 9.1. Types of infections & diagnosis - Skin and soft tissue infections, Respiratory tract infections, Cardiovascular System & Central Nervous System infections, Otitis media, Gastrointestinal tract infections, Urinary tract infections, Genital tract Infections [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 10 (4 hours)

BAC 10.1. Nosocomial Infection - Hospital Acquired Infections (HAI), risk factors, sources and route [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

BAC 10.2. Investigation, prevention and control of hospital-acquired infections. Bacteriology of air, food, water and milk [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-302 - Intermediary Metabolism and Endocrinology

Course code	BMLS-302	**Course title**	Intermediary Metabolism and Endocrinology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC5, PC9, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-302 with its corresponding practical course, Intermediary Metabolism and Endocrinology Practical. Combined course credit for BMLS-302 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of the metabolism of carbohydrates, lipids, proteins, amino acids, purines, pyrimidines and haemoglobin, biological oxidation, integration of metabolism, mineral and water-electrolyte balance and the endocrine system.

Course rationale (NCAHP): To familiarise the students with the metabolism of carbohydrates, lipids, proteins, nucleic acids, haemoglobin and minerals. Students will also gain knowledge of the basics of endocrinology.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
IME-CO1	Explain the fundamental principles of metabolism, including anabolic and catabolic pathways.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC9, PC16
IME-CO2	Describe the key metabolic pathways such as glycolysis, the citric acid cycle (TCA cycle), oxidative phosphorylation, and beta-oxidation.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC9, PC16

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
IME-CO3	Understand the regulation of metabolic pathways and the role of enzymes, cofactors, and hormones in metabolic control.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC9, PC16
IME-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC5, PC9, PC16
IME-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC5, PC9, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Metabolism of carbohydrates: Digestion and absorption, Glycolysis, TCA cycle, Gluconeogenesis, Glycogenesis and Glycogenolysis, Significance of HMP shunt and uronic acid …	9
2	Biological oxidation and Electron transport chain: Redox potentials, Biological oxidation and high-energy compounds, organisation of electron transport chain, Chemiosmoti…	6
3	Metabolism of lipid: Digestion and absorption, Beta-oxidation of fatty acids, Synthesis and breakdown of cholesterol, lipoproteins, and ketogenesis. Disorders of lipid me…	8
4	Metabolism of protein and amino acid: Digestion and absorption, transamination, Oxidative and non-oxidative deamination, Urea cycle, Creatine synthesis and degradation, M…	9
5	Integration of Metabolism: Metabolism in a well-fed state and starvation. Mineral metabolism: Regulation of the blood level of calcium, phosphorus and iron. Water and ele…	6
6	Purine and Pyrimidine metabolism: Biosynthesis of purines, pyrimidines, Breakdown of purine and pyrimidines	8
7	Haemoglobin metabolism: Oxygen dissociation curves and abnormal haemoglobin, formation and breakdown of hemoglobin	6
8	Hormones: Introduction, Classification, Major endocrine glands and their hormones, Hypothalamus, Pituitary, Thyroid, Parathyroid, Adrenal cortex, Pancreas and gonads. Mec…	8
	Total	**60**

Unit 1 (9 hours)

IME 1.1. Metabolism of carbohydrates: Digestion and absorption, Glycolysis, TCA cycle, Gluconeogenesis, Glycogenesis and Glycogenolysis, Significance of HMP shunt and uronic acid pathway; Regulation of blood glucose [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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IME 1.2. Disorders of Carbohydrate metabolism: Diabetes mellitus, glycosuria, glycogen storage diseases, galactosemia, pentosuria, fructosuria [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (6 hours)

IME 2.1. Biological oxidation and Electron transport chain: Redox potentials, Biological oxidation and high-energy compounds, organisation of electron transport chain, Chemiosmotic theory, ATP synthase, inhibitors of ATP synthase, uncouplers of oxidative phosphorylation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (8 hours)

IME 3.1. Metabolism of lipid: Digestion and absorption, Beta-oxidation of fatty acids, Synthesis and breakdown of cholesterol, lipoproteins, and ketogenesis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

IME 3.2. Disorders of lipid metabolism: Hyperlipidemia, hyperlipoproteinemias, Atherosclerosis, fatty liver [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (9 hours)

IME 4.1. Metabolism of protein and amino acid: Digestion and absorption, transamination, Oxidative and non-oxidative deamination, Urea cycle, Creatine synthesis and degradation, Metabolism of aromatic amino acids [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

IME 4.2. Disorders of Protein metabolism and amino acid metabolism: Inherited disorders associated with the urea cycle, Phenylketonuria, Alkaptonuria [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 5 (6 hours)

IME 5.1. Integration of Metabolism: Metabolism in a well-fed state and starvation [Competency: KH | Revised Bloom: L2 (Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

IME 5.2. Mineral metabolism: Regulation of the blood level of calcium, phosphorus and iron [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

IME 5.3. Water and electrolyte balance: Distribution of fluids in the body, water metabolism, factors influencing the distribution of body water, thirst mechanism, intake and loss of body water, electrolyte distribution, function and regulation, and dehydration [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (8 hours)

IME 6.1. Purine and Pyrimidine metabolism: Biosynthesis of purines, pyrimidines, Breakdown of purine and pyrimidines [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (6 hours)

IME 7.1. Haemoglobin metabolism: Oxygen dissociation curves and abnormal haemoglobin, formation and breakdown of hemoglobin [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 8 (8 hours)

IME 8.1. Hormones: Introduction, Classification, Major endocrine glands and their hormones, Hypothalamus, Pituitary, Thyroid, Parathyroid, Adrenal cortex, Pancreas and gonads; Mechanism of action of hormones [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-303 - Clinical Haematology

Course code	BMLS-303	**Course title**	Clinical Haematology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC5, PC7, PC9, PC10	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-303 with its corresponding practical course, Clinical Haematology Practical. Combined course credit for BMLS-303 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of anaemias, haemoglobinopathies, haemolytic disorders, leucocyte and platelet disorders, leukaemias, lymphomas, bone-marrow examination and disorders of haemostasis, with their laboratory diagnosis and interpretation.

Course rationale (NCAHP): Students will understand the pathophysiology and laboratory diagnosis of haematological disorders, including anaemia, leukocyte abnormalities, coagulation defects, and related morphological changes in blood cells.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CH-CO1	Comprehend knowledge of Qualitative and Quantitative disorders of Erythrocytes, leucocytes and thrombocytes.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC7, PC9, PC10

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CH-CO2	Describe the pathophysiology and clinical features of common pathological diseases.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC7, PC9, PC10
CH-CO3	Demonstrate the proper techniques for specimen collection, handling, and diagnosis of the pathological diseases.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC5, PC7, PC9, PC10
CH-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC5, PC7, PC9, PC10
CH-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC5, PC7, PC9, PC10

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination

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- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Red cell indices: Definition, normal range, and calculations with their application in diagnosing anaemia	5
2	Anaemia - Morphological and etiological classification: Signs, symptoms, aetiology, pathophysiology, and laboratory findings associated with Iron deficiency anaemia, Mega…	16
3	Leukaemia: Leukaemia: Leukemoid reaction- Definition and clinical implications, Leukaemia- Classification, definition and clinical implications, Pathophysiology, signs, s…	16
4	Haemostasis Disorders: Coagulation pathways- Extrinsic and Intrinsic Cell-Based Model of Coagulation. Coagulation Tests and Interpretation of Prothrombin, PT/INR, Activat…	16
5	Cytogenetics, Karyotyping, FISH, chromosome analysis for interpretation of malignancies	4
6	Basics of Flow Cytometry with CD markers	3
	Total	**60**

Unit 1 (5 hours)

CH 1.1. Red cell indices: Definition, normal range, and calculations with their application in diagnosing anaemia [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (16 hours)

CH 2.1. Anaemia - Morphological and etiological classification: Signs, symptoms, aetiology, pathophysiology, and laboratory findings associated with Iron deficiency anaemia, Megaloblastic anaemia, Aplastic anaemia, Hemolytic anaemia, Thalassemia, Sickle cell anaemia, Hereditary spherocytosis, Paroxysmal nocturnal hemoglobinuria [Competency: K/KH |

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Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CH 2.2. Recent advances in laboratory diagnosis of anaemia [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (16 hours)

CH 3.1. Leukaemia: Leukaemia: Leukemoid reaction- Definition and clinical implications, Leukaemia- Classification, definition and clinical implications, Pathophysiology, signs, symptoms, and laboratory diagnosis of Acute lymphoid leukaemia (ALL), Acute myeloid leukaemia (AML), Chronic lymphoid leukaemia (CLL), Chronic myeloid leukaemia (CML) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CH 3.2. Pathophysiology, signs, symptoms, and laboratory diagnosis of Polycythemia vera, Multiple Myeloma. Recent advances in laboratory diagnosis of leukaemia [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (16 hours)

CH 4.1. Haemostasis Disorders: Coagulation pathways- Extrinsic and Intrinsic Cell-Based Model of Coagulation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CH 4.2. Coagulation Tests and Interpretation of Prothrombin, PT/INR, Activated Partial Thromboplastin Time (APTT), Thrombin Time (TT), Fibrinogen, Platelet, D-dimer test, Mixing study, and factor assay Pathophysiology, signs, symptoms, and laboratory diagnosis of common bleeding / clotting disorders - Haemophilia A & B, Von-Willebrand disease, Bernard-Soulier syndrome, Glanzman's thrombasthenia, Disseminated intravascular coagulation (DIC), Immune Thrombocytopenic Purpura (ITP) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CH 4.3. Recent advances in laboratory diagnosis of coagulation disorders [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 5 (4 hours)

CH 5.1. Cytogenetics, Karyotyping, FISH, chromosome analysis for interpretation of malignancies [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (3 hours)

CH 6.1. Basics of Flow Cytometry with CD markers [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-304 - Basics of Pharmacology

Course code	BMLS-304	**Course title**	Basics of Pharmacology
Hours	Lecture 2 | Tutorial 0 | Practical 0 | Total contact hours 30	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO6, PO7, PO10
Primary competency alignment	PC5, PC9, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

Subject Description

Introduces general pharmacology, routes of administration, pharmacokinetics and pharmacodynamics, adverse drug reactions, antimicrobial chemotherapy, drugs used in hormonal and metabolic disorders and drugs acting on blood, with relevance to laboratory interpretation and therapeutic drug monitoring.

Course rationale (NCAHP): Students will gain foundational knowledge in pharmacokinetics and pharmacodynamics, adverse drug effects, commonly used drugs in infectious and metabolic disorders, and the pharmacology relevant to laboratory diagnostics and interpretation.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BP-CO1	Explain fundamental concepts of pharmacology.	KH	L2 Understand	PO1, PO6, PO7, PO10 PC5, PC9, PC16
BP-CO2	Identify major classes of drugs, their therapeutic uses, mechanisms of action, and common side effects.	K	L1 Remember	PO1, PO6, PO7, PO10 PC5, PC9, PC16

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BP-CO3	Recognise signs and symptoms of common drug toxicities and the role of the laboratory in monitoring drug therapy.	K/KH	L1-L2 Remember - Understand	PO1, PO6, PO7, PO10 PC5, PC9, PC16
BP-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO6, PO7, PO10 PC5, PC9, PC16
BP-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO6, PO7, PO10 PC5, PC9, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	General Pharmacology: Branches of Pharmacology, Routes of Drug Administration, Pharmacokinetics (Absorption, Distribution, Metabolism, Excretion), Pharmacodynamics, Adver…	8
2	Antimicrobial Chemotherapy: Classification of Antibacterial Drugs, Mechanism of Action and Resistance, Sulfonamides, Trimethoprim, Beta-lactams: Penicillin, Cephalosporin…	12
3	Drugs Related to Hormonal and Metabolic Disorders: Insulin and Oral Hypoglycemic Agents, Thyroid and Antithyroid Drugs, Corticosteroids (overview and lab monitoring), Dru…	6
4	Drugs Acting on Blood and Blood-forming Organs: Hematinics and Use in Anaemia, Coagulants and Anticoagulants, Blood Products and Plasma Expanders, Overview of Anticoagula…	4
	Total	**30**

Unit 1 (8 hours)

BP 1.1. General Pharmacology: Branches of Pharmacology, Routes of Drug Administration, Pharmacokinetics (Absorption, Distribution, Metabolism, Excretion), Pharmacodynamics, Adverse Drug Reactions, Overview of Clinical Trials and Phases, Essential Drug Concepts for Laboratory Professionals (e.g., drug half-life, therapeutic drug monitoring) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (12 hours)

BP 2.1. Antimicrobial Chemotherapy: Classification of Antibacterial Drugs, Mechanism of Action and Resistance, Sulfonamides, Trimethoprim, Beta-lactams: Penicillin, Cephalosporins [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BP 2.2. Protein Synthesis Inhibitors: Aminoglycosides, Tetracyclines, Macrolides, Antitubercular and Antileprotic Drugs, Antifungals and Antivirals, Relevance of Antibiotic Sensitivity Testing, Laboratory Role in Monitoring Antimicrobial Therapy [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (6 hours)

BP 3.1. Drugs Related to Hormonal and Metabolic Disorders: Insulin and Oral Hypoglycemic Agents, Thyroid and Antithyroid Drugs, Corticosteroids (overview and lab monitoring), Drugs affecting Calcium Balance, Antidiuretics, Relevance of Drug-induced Metabolic Changes in Lab Tests [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (4 hours)

BP 4.1. Drugs Acting on Blood and Blood-forming Organs: Hematinics and Use in Anaemia, Coagulants and Anticoagulants, Blood Products and Plasma Expanders, Overview of Anticoagulant Therapy and Its Relevance to Laboratory Monitoring (e.g., PT, INR, aPTT), Effects of Drugs on Haematological Parameters [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Suggested Readings

1. K.D. Tripathi – Essentials of Medical Pharmacology, Jaypee
2. Padmaja Udaykumar – Pharmacology for Nurses
3. Satoskar et al. – Pharmacology and Pharmacotherapeutics
4. Relevant Laboratory Manuals/Drug Interaction Charts for Lab Technicians SEMESTER IV

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BMLS-301 - Bacteriology Practical

Course code	BMLS-301	**Course title**	Bacteriology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC2, PC3, PC5, PC7, PC11	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-301 with its corresponding theory course, Bacteriology. Combined course credit for BMLS-301 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in specimen processing, culture and isolation, staining, biochemical identification, antimicrobial susceptibility testing and quality control of media and strains.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BACP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the bacteriology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC7, PC11
BACP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC7, PC11
BACP-CO3	Perform the prescribed procedures in bacteriology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC7, PC11

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BACP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC2, PC3, PC5, PC7, PC11
BACP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC2, PC3, PC5, PC7, PC11
BACP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC7, PC11

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

BACP 1. Perform pure culture study of common pathogens. (Staphylococcus aureus, Staphylococcus pyogenes, Enterococcus species, Corynebacterium diphtheriae, E. coli, Salmonella spp, Shigella spp, Pseudomonas, Proteus spp, K. pneumoniae, Vibrio cholerae, Pseudomonas aeruginosa, C. albicans). [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BACP 2. Apply diagnostic Scheme for Respiratory Tract Infections. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BACP 3. Apply diagnostic Scheme for Urinary Tract Infections. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BACP 4. Apply diagnostic for Gastrointestinal Tract Infections. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BACP 5. Apply diagnostic for Central Nervous System Infections and Bacteraemia. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BACP 6. Apply diagnostic for Skin Infections. ● (demonstrate specimen processing by manual method, including specimen receiving, Specimen inoculation into appropriate culture media, using appropriate staining method, biochemical reactions, and serological grouping for aerobic bacteria) [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BACP 7. Demonstrate bacterial identification and antibiotic susceptibility testing using manual /automated methods [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

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BACP 8. Processing of specimens for anaerobic bacteria [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BACP 9. Processing of specimens for mycobacteria [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BACP 10. Perform serological tests for the diagnosis of bacterial diseases [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

BACP 11. Identify the quality control used in the manual and automated methods [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. R. Ananthanarayan & C.K. Jayaram Paniker – Textbook of Microbiology, Universities Press
2. C.P. Baveja – Textbook of Microbiology, Arya Publications
3. Subhash Chandra Parija – Textbook of Microbiology and Immunology, Elsevier
4. Dubey R.C. – A Textbook of Microbiology, S. Chand Publishers
5. Arora D.R. – Textbook of Microbiology, CBS Publishers
6. Apurba Sankar Sastry & Sandhya Bhat K – Essentials in Medical Microbiology, Jaypee Brothers Medical Publishers
7. Mackie & McCartney – Practical Medical Microbiology, Elsevier
8. Henry D. Isenberg – Clinical Microbiology Procedures Handbook, ASM Press
9. Bailey & Scott – Diagnostic Microbiology, Elsevier
10. Koneman et al. – Colour Atlas and Textbook of Diagnostic Microbiology, Lippincott

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BMLS-302 - Intermediary Metabolism and Endocrinology Practical

Course code	BMLS-302	**Course title**	Intermediary Metabolism and Endocrinology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC3, PC4, PC5, PC6, PC9	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-302 with its corresponding theory course, Intermediary Metabolism and Endocrinology. Combined course credit for BMLS-302 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in colorimetry and photometry, estimation of glucose, urea, creatinine, protein, lipids, bilirubin and electrolytes, glucose tolerance testing and the interpretation of metabolic and endocrine profiles.

Course rationale (NCAHP): Students will be taught a relevant diagnostic test and gain hands-on experience in estimating biochemical parameters using standard kit methods used in laboratories. 1. Operate the colourimeter and spectrophotometer 2. Estimation of Plasma Glucose by GOD - POD method 3. Estimation of Total Protein by Biuret Method 4. Estimation of Albumin by the BCG method. Calculation of A/G ratio 5. Estimation of Cholesterol by modified CHOD-POD method 6. Estimation of Urea by Urease method 7. Estimation of Uric acid by uricase method 8. Estimation of creatinine by picric acid method 9. Demonstration of serum electrolytes 10. Estimation of Calcium 11. Perform qualitative urine analysis - 5-hydroxy indole acetic acid (HIAA), total porphyrins, Coproporphyrin *Clinical laboratory rotation/observation can be incorporated wherever possible

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Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
IMEP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the intermediary metabolism and endocrinology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC6, PC9
IMEP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC6, PC9
IMEP-CO3	Perform the prescribed procedures in intermediary metabolism and endocrinology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC6, PC9
IMEP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC3, PC4, PC5, PC6, PC9
IMEP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC3, PC4, PC5, PC6, PC9
IMEP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC3, PC4, PC5, PC6, PC9

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise

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- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

IMEP 1. Operate the colourimeter and spectrophotometer [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IMEP 2. Estimation of Plasma Glucose by GOD - POD method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IMEP 3. Estimation of Total Protein by Biuret Method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IMEP 4. Estimation of Albumin by the BCG method. Calculation of A/G ratio [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IMEP 5. Estimation of Cholesterol by modified CHOD-POD method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IMEP 6. Estimation of Urea by Urease method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

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IMEP 7. Estimation of Uric acid by uricase method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IMEP 8. Estimation of creatinine by picric acid method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IMEP 9. Demonstration of serum electrolytes [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IMEP 10. Estimation of Calcium [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IMEP 11. Perform qualitative urine analysis - 5-hydroxy indole acetic acid (HIAA), total porphyrins, Coproporphyrin [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. U. Sathyanarayana – Biochemistry, Elsevier
2. Robert K. Murray et al. – Harper's Illustrated Biochemistry, Tata McGraw-Hill
3. M.N. Chatterjee & Rana Shinde – Textbook of Medical Biochemistry, Jaypee
4. Alan Gowenlock – Varley's Practical Clinical Biochemistry, CBS
5. David L. Nelson & Michael M. Cox – Lehninger Principles of Biochemistry, W.H. Freeman
6. D.M. Vasudevan – Textbook of Biochemistry, Jaypee
7. A.C. Deb – Fundamentals of Biochemistry, New Central Book Agency
8. Y.K. Joshi – Basics of Clinical nutrition, Jaypee publishers
9. Nader Rifai et al, Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, Saunders / Elsevier

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BMLS-303 - Clinical Haematology Practical

Course code	BMLS-303	**Course title**	Clinical Haematology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC5, PC7, PC9, PC10	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-303 with its corresponding theory course, Clinical Haematology. Combined course credit for BMLS-303 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in peripheral smear examination, reticulocyte count, bone-marrow smear staining, haemoglobin variant and thalassaemia testing, osmotic fragility, sickling test and first-line haemostasis testing with clinical correlation.

Course rationale (NCAHP): Students will gain practical skills necessary for various laboratory investigations required for the diagnosis of haematological disorders and compare them with normal values and clinical conditions. 1. Preparation and staining of peripheral smear using Leishman's stain. 2. Identification of normal and abnormal morphology of red blood cells, white blood cells, and platelets. 3. Peripheral smear study, its correlation with clinical symptoms and comparison of peripheral smear results with complete blood count (CBC). 4. Reticulocyte count and its correlation with clinical symptoms 5. Demonstration of bone marrow aspiration and smear preparation. 6. Staining of bone marrow smears (Pearls 'Prussian blue stain) and its correlation with clinical symptoms 7. Preparation of iso-osmotic sucrose solution and performance of sucrose lysis test. 8. Identification of tests for hemoglobin variants and thalassemia.

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Explanation and interpretation of hemoglobin electrophoresis (e.g., sickle cell anaemia, thalassemia). 9. Sickling test. Performance and interpretation of the osmotic fragility test 10. Bleeding time, Clotting time, Prothrombin time (PT), Activated partial thromboplastin time (aPTT). Thrombin time, Platelet count, Fibrinogen count, and interpretation of first-line hemostasis tests. Blood collection procedures related to coagulation testing. Performance and interpretation of: Clot retraction, Inhibitor assays. Platelet function tests. 11. Identify the tests to detect hereditary haemolytic anaemia. Prepare reagents for the osmotic fragility test. Perform the osmotic fragility test and interpret the results. Integrate clinical symptoms and laboratory investigations to identify haematological disorders *Clinical laboratory rotation/observation can be incorporated wherever possible

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CHP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the clinical haematology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC5, PC7, PC9, PC10
CHP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC5, PC7, PC9, PC10
CHP-CO3	Perform the prescribed procedures in clinical haematology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC5, PC7, PC9, PC10
CHP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC5, PC7, PC9, PC10
CHP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC5, PC7, PC9, PC10
CHP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC5, PC7, PC9, PC10

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Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

CHP 1. Preparation and staining of peripheral smear using Leishman's stain. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHP 2. Identification of normal and abnormal morphology of red blood cells, white blood cells, and platelets. [Competency: SH | Revised Bloom: L3 (Apply) |

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Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHP 3. Peripheral smear study, its correlation with clinical symptoms and comparison of peripheral smear results with complete blood count (CBC). [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHP 4. Reticulocyte count and its correlation with clinical symptoms [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHP 5. Demonstration of bone marrow aspiration and smear preparation. [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHP 6. Staining of bone marrow smears (Pearls 'Prussian blue stain) and its correlation with clinical symptoms [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHP 7. Preparation of iso-osmotic sucrose solution and performance of sucrose lysis test. [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHP 8. Identification of tests for hemoglobin variants and thalassemia. Explanation and interpretation of hemoglobin electrophoresis (e.g., sickle cell anaemia, thalassemia). [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHP 9. Sickling test. Performance and interpretation of the osmotic fragility test [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHP 10. Bleeding time, Clotting time, Prothrombin time (PT), Activated partial thromboplastin time (aPTT). Thrombin time, Platelet count, Fibrinogen count, and interpretation of first-line hemostasis tests. Blood collection procedures related to coagulation testing. Performance and interpretation of: Clot retraction, Inhibitor assays. Platelet function tests. [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHP 11. Identify the tests to detect hereditary haemolytic anaemia. Prepare reagents for the osmotic fragility test. Perform the osmotic fragility test and interpret the results. Integrate clinical symptoms and laboratory investigations to identify haematological disorders [Competency: SH/P | Revised

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Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. Sood, R. (2009). Medical Laboratory Technology, Vol-1 : Methods of Interpretation (6th). India: Jaypee Brothers.
2. Dacie, J. V. (2006). Dacie and Lewis practical haematology. Elsevier Health Sciences.
3. McKenzie, S. B., Williams, J. L., & Landis-Piwowar, K. (2004). Clinical laboratory hematology (Vol. 1). Pearson education.
4. Ramakrishnan, S., & Sulochana, K. N. (Eds.). (2012). Manual of Medical laboratory techniques. Jaypee Brothers Medical Publishers Pvt. Ltd.
5. Godkar, P. B., & Godkar, D. P. (2006). Textbook of medical laboratory technology. Bhalani publishing house.

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Semester IV - Course Structure, Hours and Credits

Sl. No.	Course	Lecture	Tutorial	Practical	Credits	Contact hours
1	BMLS-401 Virology and Immunology	4	0	4	6	120
2	BMLS-402 Genetics and Molecular Biology	4	0	4	6	120
3	BMLS-403 Clinical Pathology	4	0	4	6	120
4	BMLS-404 Medical Laboratory Management and Quality Control	2	0	0	2	30
	Grand Total	**14**	**0**	**12**	**20**	**390**

 # Non-University examination subject (NUES), conducted at the institution level as prescribed by the RGUHS Board of Studies. Prescribed semester totals: 390 contact hours and 20 credits.

Semester IV - Examination Scheme

Course	Continuous (internal) assessment	End-semester examination	Total	Status
BMLS-401 Virology and Immunology	30	70	100	University
BMLS-402 Genetics and Molecular Biology	30	70	100	University
BMLS-403 Clinical Pathology	30	70	100	University
BMLS-404 Medical Laboratory Management and Quality Control	30	70	100	University
BMLS-401 Virology and Immunology Practical	30	70	100	University
BMLS-402 Genetics and Molecular Biology Practical	30	70	100	University
BMLS-403 Clinical Pathology Practical	30	70	100	University
Grand Total	**210**	**490**	**700**	

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Semester IV - Course-to-Competency Overview

Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-401 Virology and Immunology	Develops understanding of viral structure, replication, cultivation and laboratory diagnosis, medically important viruses, biosafety in virology, and the innate and adaptive immune system, antigen-antibody reactions, complement, hypersensitivity, autoimmunity, immunodeficiency and immunisation.	PO1, PO2, PO6, PO7	PC5, PC9, PC11, PC16
BMLS-402 Genetics and Molecular Biology	Develops understanding of Mendelian and human genetics, chromosomes and cytogenetics, inherited disorders, nucleic acid structure, replication, transcription and translation, gene regulation, mutation and repair, and the principles of molecular diagnostic technology.	PO1, PO2, PO6, PO7, PO9	PC5, PC9, PC12, PC16, PC17
BMLS-403 Clinical Pathology	Develops understanding of the formation, composition, collection and analysis of urine, faeces, semen, sputum and body fluids, differentiation of normal from abnormal findings, sources of error and recent advances including automation in clinical pathology.	PO1, PO2, PO6, PO7	PC1, PC2, PC5, PC9, PC10
BMLS-404 Medical Laboratory Management and Quality Control	Develops understanding of total quality management in clinical laboratories, internal and external quality control, accreditation and certification under ISO 15189 and NABL, laboratory automation, inventory and workflow management and laboratory information systems.	PO2, PO4, PO7, PO8, PO9, PO10	PC4, PC6, PC7, PC8, PC12, PC18

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Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-401 Virology and Immunology Practical	Trains the learner in specimen collection and transport for viral diagnosis, serological and rapid tests, ELISA, agglutination and precipitation reactions, and the performance and interpretation of immunological assays.	PO2, PO6, PO7	PC2, PC5, PC7, PC9, PC11
BMLS-402 Genetics and Molecular Biology Practical	Trains the learner in nucleic acid extraction and quantification, electrophoresis, PCR and real-time PCR set-up, karyotyping and the documentation and interpretation of molecular results.	PO2, PO6, PO7, PO9	PC3, PC4, PC5, PC12, PC17
BMLS-403 Clinical Pathology Practical	Trains the learner in the physical, chemical and microscopic examination of urine, stool, semen, sputum and body fluids, cell counting in fluids, occult blood testing and the interpretation and reporting of findings.	PO2, PO6, PO7	PC1, PC2, PC5, PC6, PC9

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BMLS-401 - Virology and Immunology

Course code	BMLS-401	**Course title**	Virology and Immunology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC5, PC9, PC11, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-401 with its corresponding practical course, Virology and Immunology Practical. Combined course credit for BMLS-401 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of viral structure, replication, cultivation and laboratory diagnosis, medically important viruses, biosafety in virology, and the innate and adaptive immune system, antigen-antibody reactions, complement, hypersensitivity, autoimmunity, immunodeficiency and immunisation.

Course rationale (NCAHP): Students will understand the morphology and general features of viruses and gain comprehensive knowledge of the immune system, immune response, and diagnostic immunological techniques.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
VI-CO1	Identify clinically significant viruses that cause human disease and understand immunology.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC9, PC11, PC16

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
VI-CO2	Describe the pathogenesis, clinical features, and modes of transmission of common infectious diseases.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC9, PC11, PC16
VI-CO3	Demonstrate proper techniques for specimen collection, handling, and processing in a clinical laboratory.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC5, PC9, PC11, PC16
VI-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC5, PC9, PC11, PC16
VI-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC5, PC9, PC11, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination

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- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Introduction to virology: History of viruses, Viral taxonomy, Virus replication, Viral pathogenesis, Viral factors, Viral Growth Curve, Viral Growth Cycle. Host response,…	5
2	Cultivation of Viruses, Detection of Virus Growth in Cell Culture, Different methods of cultivation of viruses, animal inoculations, egg inoculation, cell culture, Viral …	5
3	Laboratory Diagnosis of Viral Infections:(1) direct detection of viruses/viral antigens, (2) demonstration of virus-induced cytopathic effects (CPEs) in the cells, (3) vi…	7
4	Classify medically important viruses, Morphology, cultural characteristics, pathogenesis, lab diagnosis and treatment of Herpes virus, Poxviruses, Rhabdovirus, Orthomyxov…	15
5	Prevention and Precautions in Virology: Safety precautions in the virology laboratory, Antiviral drugs	3
6	Immunology: The Immune Response, Innate immunity, adaptive immunity, acquired immunity- active and passive immunity	3
7	Immune system: components of the immune system, immune cells and their functions, organs of the immune system - primary and secondary immune organs	3
8	Antigen and antibody: Types of antigens and determinants of antigenicity, Structure and functions of different immunoglobulins, Properties and functions of antibodies- mo…	5
9	Complement system: definition, components and activation pathways. Hypersensitivity- definition, types of hypersensitivity reactions	5
10	Autoimmune diseases: Primary and secondary immune deficiency disorders. Autoimmunity: Basic concepts of autoimmunity, risk factors and mechanisms of autoimmunity	4

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Unit	Topic	Hours
11	Immunisation/Vaccination: Active and passive immunisation, classification of vaccines, and immunisation schedule in India. Brief knowledge about the extended programme of…	2
12	Integration, revision, tutorial, structured problem-solving and formative assessment mapped to the course outcomes of this course (RGUHS reconciliation of the prescribed …	3
	Total	**60**

Unit 1 (5 hours)

VI 1.1. Introduction to virology: History of viruses, Viral taxonomy, Virus replication, Viral pathogenesis, Viral factors, Viral Growth Curve, Viral Growth Cycle; Host response, Environmental factors [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (5 hours)

VI 2.1. Cultivation of Viruses, Detection of Virus Growth in Cell Culture, Different methods of cultivation of viruses, animal inoculations, egg inoculation, cell culture, Viral Assay, Viral Genetics, Classification of Viruses [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (7 hours)

VI 3.1. Laboratory Diagnosis of Viral Infections:(1) direct detection of viruses/viral antigens, (2) demonstration of virus-induced cytopathic effects (CPEs) in the cells, (3) virus isolation, (4) viral assays, (5) detection of viral proteins and other enzymes, (6) detection of the viral genome and (7) viral serology [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (15 hours)

VI 4.1. Classify medically important viruses, Morphology, cultural characteristics, pathogenesis, lab diagnosis and treatment of Herpes virus, Poxviruses, Rhabdovirus, Orthomyxoviruses, Paramyxoviruses, Polio virus, Hepatitis virus, HIV, Oncogenic viruses, Arboviruses [Competency: KH | Revised

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Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (3 hours)

VI 5.1. Prevention and Precautions in Virology: Safety precautions in the virology laboratory, Antiviral drugs [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (3 hours)

VI 6.1. Immunology: The Immune Response, Innate immunity, adaptive immunity, acquired immunity- active and passive immunity [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (3 hours)

VI 7.1. Immune system: components of the immune system, immune cells and their functions, organs of the immune system - primary and secondary immune organs [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 8 (5 hours)

VI 8.1. Antigen and antibody: Types of antigens and determinants of antigenicity, Structure and functions of different immunoglobulins, Properties and functions of antibodies- monoclonal and polyclonal antibodies [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

VI 8.2. Antigen-Antibody reactions- Definition, Classification, General features, and mechanisms, applications of various antigen-antibody reactions Immune response: Classify immune response- Primary &Secondary Basic concept of humoral and cell-mediated immunity, Cytokines- define, classify, properties and functions [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 9 (5 hours)

VI 9.1. Complement system: definition, components and activation pathways. Hypersensitivity- definition, types of hypersensitivity reactions [Competency:

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K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 10 (4 hours)

VI 10.1. Autoimmune diseases: Primary and secondary immune deficiency disorders [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

VI 10.2. Autoimmunity: Basic concepts of autoimmunity, risk factors and mechanisms of autoimmunity [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 11 (2 hours)

VI 11.1. Immunisation/Vaccination: Active and passive immunisation, classification of vaccines, and immunisation schedule in India [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

VI 11.2. Brief knowledge about the extended programme of immunisation (EPI) in India [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 12 (3 hours)

VI 12.1. Integration, revision, tutorial, structured problem-solving and formative assessment mapped to the course outcomes of this course (RGUHS reconciliation of the prescribed contact hours) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-402 - Genetics and Molecular Biology

Course code	BMLS-402	**Course title**	Genetics and Molecular Biology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7, PO9
Primary competency alignment	PC5, PC9, PC12, PC16, PC17	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-402 with its corresponding practical course, Genetics and Molecular Biology Practical. Combined course credit for BMLS-402 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of Mendelian and human genetics, chromosomes and cytogenetics, inherited disorders, nucleic acid structure, replication, transcription and translation, gene regulation, mutation and repair, and the principles of molecular diagnostic technology.

Course rationale (NCAHP): Students will learn the fundamentals of Genetics and molecular biology in order to understand the molecular basis of disease, perform and interpret basic molecular diagnostic tests.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
GMB-CO1	Explain how genetic information is copied, transferred, and used in cells.	KH	L2 Understand	PO1, PO2, PO6, PO7, PO9 PC5, PC9, PC12, PC16, PC17

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
GMB-CO2	Describe how genes are inherited and how traits are passed through generations.	KH	L2 Understand	PO1, PO2, PO6, PO7, PO9 PC5, PC9, PC12, PC16, PC17
GMB-CO3	Identify common laboratory techniques used to study genes.	K	L1 Remember	PO1, PO2, PO6, PO7, PO9 PC5, PC9, PC12, PC16, PC17
GMB-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7, PO9 PC5, PC9, PC12, PC16, PC17
GMB-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7, PO9 PC5, PC9, PC12, PC16, PC17

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination

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- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Introduction to Genetics: Mendelian genetics –Principle of dominance, Principle of segregation, Principle of Independent Assortment, Genotype & phenotype; homozygous …	8
2	Chromosomal basis of Inheritance: Chromosome morphology- size and shape; Euchromatin and Heterochromatin- constitutive and facultative heterochromatin Chromosomes: Packag…	12
3	Cell division and chromosome segregation: Mitosis – Stages in mitotic cell division- significance of mitosis. Meiosis – Formation of Synaptonemal complex, crossing over, …	6
4	Molecular basis of Inheritance Structure of DNA and RNA, DNA replication, Mutations: types of mutations- transition, transversion, frame shift, silent, missense and nonse…	10
5	Gene expression and regulation Structure of eukaryotic gene, Transcriptional machinery in eukaryotes (RNA polymerases) and their structural and functional features; Genet…	12
6	Molecular Diagnostics ● Spectroscopy – principle, instrumentation, ultraviolet and visible light spectroscopy, and its applications ● Chromatography– types of chromatogra…	12
	Total	**60**

Unit 1 (8 hours)

GMB 1.1. Introduction to Genetics: Mendelian genetics –Principle of dominance, Principle of segregation, Principle of Independent Assortment, Genotype & phenotype; homozygous & heterozygous; dominant& recessive; gene & allele, Trait Inheritance – ABO blood groups in human; Polygenic Inheritance –Kernel colour in Maize, skin colour in man, Sex-linked Inheritance – haemophilia and colour blindness in man, Non- Mendelian Inheritance-Maternal inheritance [Competency: K/KH | Revised Bloom: L1-L2

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(Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (12 hours)

GMB 2.1. Chromosomal basis of Inheritance: Chromosome morphology- size and shape; Euchromatin and Heterochromatin- constitutive and facultative heterochromatin Chromosomes: Packaging of DNA in to Chromosomes, structure (centromere and telomere), karyotype, Structural chromosomal aberrations - duplications, deletions, inversions & translocations with examples, Genetic consequences, Numerical chromosomal aberrations – aneuploidy, euploidy auto-polyploidy and allo- polyploidy, Genetic consequences [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (6 hours)

GMB 3.1. Cell division and chromosome segregation: Mitosis – Stages in mitotic cell division- significance of mitosis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

GMB 3.2. Meiosis – Formation of Synaptonemal complex, crossing over, chiasma formation, significance of meiosis. stages of mitosis, meiosis I&II& fertilization [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (10 hours)

GMB 4.1. Molecular basis of Inheritance Structure of DNA and RNA, DNA replication, Mutations: types of mutations- transition, transversion, frame shift, silent, missense and nonsense [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (12 hours)

GMB 5.1. Gene expression and regulation Structure of eukaryotic gene, Transcriptional machinery in eukaryotes (RNA polymerases) and their structural and functional features; Genetic code, Transcription, translation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 6 (12 hours)

GMB 6.1. Molecular Diagnostics [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

GMB 6.2. Spectroscopy – principle, instrumentation, ultraviolet and visible light spectroscopy, and its applications [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

GMB 6.3. Chromatography– types of chromatographic techniques (paper, ion exchange, chromatography, size exclusion chromatography)- principle & applications; Centrifugation–principle and applications [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

GMB 6.4. Electrophoretic techniques- types (Agarose gel electrophoresis, SDS PAGE), principle & applications [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

GMB 6.5. Microscopy- principle & applications of Phase contrast microscope and bright field and fluorescence microscopy; PCR - principles and applications [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

GMB 6.6. Quantitative Real Time PCR– principle and applications; DNA Sequencing – principle and applications [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

GMB 6.7. Microarray- DNA and protein arrays - principle and applications [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

GMB 6.8. Blotting techniques- Southern blot, Northern blot and Western blot- principle and applications [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

GMB 6.9. Fluorescence &Chemiluminescence Imaging- principle and applications [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-403 - Clinical Pathology

Course code	BMLS-403	**Course title**	Clinical Pathology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC1, PC2, PC5, PC9, PC10	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-403 with its corresponding practical course, Clinical Pathology Practical. Combined course credit for BMLS-403 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of the formation, composition, collection and analysis of urine, faeces, semen, sputum and body fluids, differentiation of normal from abnormal findings, sources of error and recent advances including automation in clinical pathology.

Course rationale (NCAHP): Students will understand the principles and procedures for analysing urine, faeces, semen, sputum, and body fluids. They will learn to differentiate normal from abnormal findings and apply analytical techniques in clinical diagnosis.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CPA-CO1	Comprehend knowledge of formation, composition and function of body fluids.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC1, PC2, PC5, PC9, PC10

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CPA-CO2	Demonstrate proper technique for specimen collection, handling, and processing in a clinical Pathology laboratory.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC1, PC2, PC5, PC9, PC10
CPA-CO3	Apply standard laboratory techniques for the identification of the aetiology of infection.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC1, PC2, PC5, PC9, PC10
CPA-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC1, PC2, PC5, PC9, PC10
CPA-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC1, PC2, PC5, PC9, PC10

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination

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- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Urine analysis: Formation and Normal Composition of urine, Indication of urine analysis, collection of urine, preservatives used for urine sample, examination of urine – …	12
2	Faecal analysis: Formation and Normal composition of stool, specimen collection, scotch tape preparation, Preservatives of stool specimen, Physical, chemical and microsco…	10
3	Semen analysis: Formation of semen, method of collection, importance and method of semen analysis - Normal and abnormal morphology of sperms Physical and chemical charact…	8
4	Sputum Analysis: Formation of Sputum, Collection of Sputum, Analysis of Sputum	6
5	Body fluids: Different body fluids and methods of aspiration, characteristics of normal and abnormal body fluids, physical, chemical, and microscopic analysis of body flu…	15
6	Recent advances in clinical pathology that have led to the use of special stains in clinical pathology, and outline sample processing using automation in clinical patholo…	4
7	Integration, revision, tutorial, structured problem-solving and formative assessment mapped to the course outcomes of this course (RGUHS reconciliation of the prescribed …	5
	Total	**60**

Unit 1 (12 hours)

CPA 1.1. Urine analysis: Formation and Normal Composition of urine, Indication of urine analysis, collection of urine, preservatives used for urine sample, examination of urine – Manual methods, dipstick method, urine analysers [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) |

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Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CPA 1.2. Physical examination of urine and interpret the result - Volume, colour, odour, specific gravity, pH, turbidity [Competency: KH/SH | Revised Bloom: L4 (Analyze) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CPA 1.3. Chemical examination of urine and interpret the result for - Glucose - Protein - Blood - Ketones - Bile salt - Bile pigment [Competency: KH/SH | Revised Bloom: L4 (Analyze) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CPA 1.4. Examination for hemosiderin, chyluria, fat globules, and myoglobin detection in urine [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CPA 1.5. Microscopic examination of urine- cells, casts, crystals, organisms, others [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CPA 1.6. Characteristics of a normal and abnormal urine sample. List advanced techniques used in the field of diagnosis, Sources of errors, and Clinical conditions using laboratory results of urine analysis [Competency: K | Revised Bloom: L1 (Remember) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (10 hours)

CPA 2.1. Faecal analysis: Formation and Normal composition of stool, specimen collection, scotch tape preparation, Preservatives of stool specimen, Physical, chemical and microscopic faecal analysis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CPA 2.2. Physical examination-Volume, colour, consistency, odour, Blood, Mucus and Adult parasites; Test for occult blood [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CPA 2.3. Saline and Iodine wet preparation, Concentration method, floatation method, and methylene blue stain [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 3 (8 hours)

CPA 3.1. Semen analysis: Formation of semen, method of collection, importance and method of semen analysis - Normal and abnormal morphology of sperms Physical and chemical characteristics, sperm count, and Medico-legal aspects of specimen analysis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (6 hours)

CPA 4.1. Sputum Analysis: Formation of Sputum, Collection of Sputum, Analysis of Sputum [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (15 hours)

CPA 5.1. Body fluids: Different body fluids and methods of aspiration, characteristics of normal and abnormal body fluids, physical, chemical, and microscopic analysis of body fluids, procedure of cell count, clinical conditions - CSF, peritoneal, pericardial, pleural and synovial fluid Other body fluids: Function, volume and chemical composition, specimen collection, handling of amniotic fluid, examination of amniotic fluid, special tests performed in amniotic fluid Examination of bronchoalveolar Lavage, saliva, sweat, and tears [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (4 hours)

CPA 6.1. Recent advances in clinical pathology that have led to the use of special stains in clinical pathology, and outline sample processing using automation in clinical pathology [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (5 hours)

CPA 7.1. Integration, revision, tutorial, structured problem-solving and formative assessment mapped to the course outcomes of this course (RGUHS reconciliation of the prescribed contact hours) [Competency: K/KH | Revised

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Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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59. BMLS-404 - Medical Laboratory Management and Quality Control

Course code	BMLS-404	**Course title**	Medical Laboratory Management and Quality Control
Hours	Lecture 2 | Tutorial 0 | Practical 0 | Total contact hours 30	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO4, PO7, PO8, PO9, PO10
Primary competency alignment	PC4, PC6, PC7, PC8, PC12, PC18	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

Subject Description

Develops understanding of total quality management in clinical laboratories, internal and external quality control, accreditation and certification under ISO 15189 and NABL, laboratory automation, inventory and workflow management and laboratory information systems.

Course rationale (NCAHP): Students are introduced to medical laboratories, quality management, laboratory information management systems applied in diagnostic laboratories, laboratory automation and point of care testing

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
MLM-CO1	Explain the principles of effective laboratory organisation, administration, and workflow planning.	KH	L2 Understand	PO2, PO4, PO7, PO8, PO9, PO10 PC4, PC6, PC7, PC8, PC12, PC18
MLM-CO2	Demonstrate knowledge of quality assurance (QA) and quality control (QC) practices in laboratory settings.	SH	L3 Apply	PO2, PO4, PO7, PO8, PO9, PO10 PC4, PC6, PC7, PC8, PC12, PC18

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
MLM-CO3	Understand laboratory accreditation standards and regulatory requirements.	KH	L2 Understand	PO2, PO4, PO7, PO8, PO9, PO10 PC4, PC6, PC7, PC8, PC12, PC18
MLM-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO2, PO4, PO7, PO8, PO9, PO10 PC4, PC6, PC7, PC8, PC12, PC18
MLM-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO2, PO4, PO7, PO8, PO9, PO10 PC4, PC6, PC7, PC8, PC12, PC18

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Total quality management of clinical laboratories: Define a quality management system, the three phases of the laboratory testing process, laboratory error, and quality i…	6
2	Accreditation and certification of laboratories: Define accreditation, certification and accreditation bodies. Explain the National Accreditation Board for Testing and Ca…	4
3	Automation in Laboratory Workflow: Definition, Automation in Preanalytical, Analytical, and Post-analytical Phases. Types of Analyzers: Continuous Flow, Discrete and Dry …	12
4	Integration, revision, tutorial, structured problem-solving and formative assessment mapped to the course outcomes of this course (RGUHS reconciliation of the prescribed …	8
	Total	**30**

Unit 1 (6 hours)

MLM 1.1. Total quality management of clinical laboratories: Define a quality management system, the three phases of the laboratory testing process, laboratory error, and quality indicators [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MLM 1.2. List the quality indicators in the preanalytical phase and the sources of errors in the preanalytical, analytical, and postanalytical phases; Define the Root Cause Analysis (RCA) process [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MLM 1.3. Define corrective actions and preventive actions (CAPA), CAPA for the control and prevention of errors in the clinical laboratory [Competency: K | Revised Bloom: L1 (Remember) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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MLM 1.4. Classify quality control: Internal quality control method, formulating quality control charts, Levey- Jenning charts, and Interpretation of Westgard rules [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MLM 1.5. Explain external quality control method, the proficiency testing method in the clinical laboratory, and illustrate good laboratory practice [Competency: KH | Revised Bloom: L2 (Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (4 hours)

MLM 2.1. Accreditation and certification of laboratories: Define accreditation, certification and accreditation bodies [Competency: K | Revised Bloom: L1 (Remember) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MLM 2.2. Explain the National Accreditation Board for Testing and Calibration Laboratories (NABL) and the International Organisation for Standardisation (ISO); Summarise the benefits of accreditation [Competency: KH | Revised Bloom: L2 (Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MLM 2.3. Audit in a Medical Laboratory - Introduction and Importance, Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation, Procurement of equipment and Inventory Control [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (12 hours)

MLM 3.1. Automation in Laboratory Workflow: Definition, Automation in Preanalytical, Analytical, and Post-analytical Phases [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MLM 3.2. Types of Analyzers: Continuous Flow, Discrete and Dry Chemistry Analyzers [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MLM 3.3. Automation in Immunology, Microbiology, Histopathology, Haematology, Biochemistry, Clinical Pathology [Competency: K/KH | Revised

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Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (8 hours)

MLM 4.1. Integration, revision, tutorial, structured problem-solving and formative assessment mapped to the course outcomes of this course (RGUHS reconciliation of the prescribed contact hours) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Suggested Readings

1. Mirnali Sant, Textbook of Medical laboratory Technology, CBS publishers
2. Godkar PB, Textbook of Medical laboratory Technology, Bhalani publishing house
3. Paszko Christine, Turner Elizabeth (2001) Laboratory Information Management Systems (2nd edition) CRC Press Inc
4. Douglas Shawn (2023). The Complete Guide to LIMS and Laboratory Informatics (1st edition) LabLynx Press SEMESTER V

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BMLS-401 - Virology and Immunology Practical

Course code	BMLS-401	**Course title**	Virology and Immunology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC2, PC5, PC7, PC9, PC11	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-401 with its corresponding theory course, Virology and Immunology. Combined course credit for BMLS-401 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in specimen collection and transport for viral diagnosis, serological and rapid tests, ELISA, agglutination and precipitation reactions, and the performance and interpretation of immunological assays.

Course rationale (NCAHP): Students will demonstrate and perform diagnostic tests for viral infections and immunological disorders using serological and molecular techniques. 1. Collection, transport and processing of various clinical specimens for Virology 2. Identify the tests used for the diagnosis of viral infections 3. Integrate knowledge in the diagnosis of given clinical cases 4. Identify viruses and their replication using charts. 5. Perform Staining- Giemsa stain, Seller's stain, immunofluorescent staining procedures for the diagnosis of viral infections. 6. Demonstrate various inoculation routes in a fertilised hen egg 7. Perform serological tests, i.e. Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation), ASO Anti-Streptolysin O, C-Reactive Protein (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaler test, RPR 8. Demonstrate ELISA, immunodiffusion, immunofluorescence, and

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Western blotting. *Clinical Laboratory rotation/observation can be incorporated wherever possible

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
VIP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the virology and immunology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC5, PC7, PC9, PC11
VIP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC2, PC5, PC7, PC9, PC11
VIP-CO3	Perform the prescribed procedures in virology and immunology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC5, PC7, PC9, PC11
VIP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC2, PC5, PC7, PC9, PC11
VIP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC2, PC5, PC7, PC9, PC11
VIP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC5, PC7, PC9, PC11

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis

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- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

VIP 1. Collection, transport and processing of various clinical specimens for Virology [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

VIP 2. Identify the tests used for the diagnosis of viral infections [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

VIP 3. Integrate knowledge in the diagnosis of given clinical cases [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

VIP 4. Identify viruses and their replication using charts. [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

VIP 5. Perform Staining- Giemsa stain, Seller's stain, immunofluorescent staining procedures for the diagnosis of viral infections. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

VIP 6. Demonstrate various inoculation routes in a fertilised hen egg [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM:

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demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

VIP 7. Perform serological tests, i.e. Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation), ASO Anti-Streptolysin O, C-Reactive Protein (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaler test, RPR [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

VIP 8. Demonstrate ELISA, immunodiffusion, immunofluorescence, and Western blotting. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. R. Ananthanarayan & C.K. Jayaram Paniker – Textbook of Microbiology, Universities Press
2. Apurba Sankar Sastry & Sandhya Bhat K – Essentials in Medical Microbiology, Jaypee Brothers Medical Publishers
3. Surinder Kumar – Essentials of Microbiology, Jaypee Brothers Medical Publishers
4. Subhash Chandra Parija – Textbook of Microbiology and Immunology, Elsevier
5. Fields Virology – Editors: David M. Knipe & Peter M. Howley, Published by Lippincott Williams & Wilkins
6. P. Daniel Fudenberg, H. Hugh Fudenberg & John Stites – Basic & Clinical Immunology, Lange Medical Books
7. Kuby Immunology – Authors: Jenni Punt, Sharon Stranford, Patricia Jones & Judy Owen, Published by W.H. Freeman
8. S.K. Gupta – Essentials of Immunology, Jaypee Brothers Medical Publishers

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BMLS-402 - Genetics and Molecular Biology Practical

Course code	BMLS-402	**Course title**	Genetics and Molecular Biology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7, PO9
Primary competency alignment	PC3, PC4, PC5, PC12, PC17	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-402 with its corresponding theory course, Genetics and Molecular Biology. Combined course credit for BMLS-402 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in nucleic acid extraction and quantification, electrophoresis, PCR and real-time PCR set-up, karyotyping and the documentation and interpretation of molecular results.

Course rationale (NCAHP): Students will demonstrate and perform diagnostic tests widely used in molecular biology labs 1. Extraction of genomic DNA 2. Quantification of DNA by spectrophotometer 3. Agarose gel electrophoresis of DNA 4. Estimation of DNA by DPA method 5. Estimation of RNA by orcinol method 6. Estimation of Protein by BSA method 7. Western blotting 8. Karyotyping (normal male/normal female) 9. Identification of chromosome anomalies using Idiograms– Autosomal disorders (Down Syndrome / Edward's syndrome, Klienefelter's syndrome / Turner's syndrome) *Clinical Laboratory rotation/observation can be incorporated wherever possible

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Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
GMBP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the genetics and molecular biology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7, PO9 PC3, PC4, PC5, PC12, PC17
GMBP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7, PO9 PC3, PC4, PC5, PC12, PC17
GMBP-CO3	Perform the prescribed procedures in genetics and molecular biology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7, PO9 PC3, PC4, PC5, PC12, PC17
GMBP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7, PO9 PC3, PC4, PC5, PC12, PC17
GMBP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7, PO9 PC3, PC4, PC5, PC12, PC17
GMBP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7, PO9 PC3, PC4, PC5, PC12, PC17

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise

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- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

GMBP 1. Extraction of genomic DNA [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

GMBP 2. Quantification of DNA by spectrophotometer [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

GMBP 3. Agarose gel electrophoresis of DNA [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

GMBP 4. Estimation of DNA by DPA method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

GMBP 5. Estimation of RNA by orcinol method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

GMBP 6. Estimation of Protein by BSA method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

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GMBP 7. Western blotting [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

GMBP 8. Karyotyping (normal male/normal female) [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

GMBP 9. Identification of chromosome anomalies using Idiograms–Autosomal disorders (Down Syndrome / Edward's syndrome, Klienefelter's syndrome / Turner's syndrome) [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. Molecular Cell Biology 6th edition (2007) Harvey F Lodish
2. Techniques for molecular biology, D.Tagu C. Moussard, CRC Press
3. Molecular diagnostics: for the clinical laboratorian by William B. Coleman and Gregory J. Tsongalis. Publisher: Humana Press

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2. BMLS-403 - Clinical Pathology Practical

Course code	BMLS-403	**Course title**	Clinical Pathology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC1, PC2, PC5, PC6, PC9	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-403 with its corresponding theory course, Clinical Pathology. Combined course credit for BMLS-403 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in the physical, chemical and microscopic examination of urine, stool, semen, sputum and body fluids, cell counting in fluids, occult blood testing and the interpretation and reporting of findings.

Course rationale (NCAHP): Students will demonstrate and perform physical, chemical, and microscopic examinations of clinical specimens using manual and automated methods. Preanalytical: Proper method of sample identification for inpatients and Outpatients, Sample transport and processing, Sample acceptance and rejection criteria 1. Identify and process clinical specimens (urine, stool, semen, sputum, CSF, pleural, peritoneal, synovial, pericardial fluids) 2. Perform physical, chemical, and microscopic analysis of urine and stool 3. Conduct special test in urine -hemoglobin & myoglobin, pregnancy test 4. Perform Stool analysis – Physical, Chemical and Microscopic Examination 5. Perform semen analysis- Physical, Chemical and Microscopic Examination 6. Perform Cerebrospinal Fluid (CSF) examination - Physical, Chemical, and Microscopic Examination 7. Perform Sputum Analysis- physical, chemical, and microscopic examination 8. Perform Pleural Fluid examination -physical, chemical, and microscopic examination 9. Perform Synovial fluid examination- physical, chemical, and microscopic examination 10. Perform Peritoneal Fluid examination-

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physical, chemical and microscopic examination 11. Perform Pericardial Fluid examination- physical, chemical, and microscopic examination 12. Operate the automation system used in Clinical pathology *Clinical Laboratory rotation/observation can be incorporated wherever possible

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CPAP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the clinical pathology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC1, PC2, PC5, PC6, PC9
CPAP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC1, PC2, PC5, PC6, PC9
CPAP-CO3	Perform the prescribed procedures in clinical pathology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC1, PC2, PC5, PC6, PC9
CPAP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC1, PC2, PC5, PC6, PC9
CPAP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC1, PC2, PC5, PC6, PC9
CPAP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC1, PC2, PC5, PC6, PC9

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists

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- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

CPAP 1. Identify and process clinical specimens (urine, stool, semen, sputum, CSF, pleural, peritoneal, synovial, pericardial fluids) [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 2. Perform physical, chemical, and microscopic analysis of urine and stool [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 3. Conduct special test in urine -hemoglobin & myoglobin, pregnancy test [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 4. Perform Stool analysis – Physical, Chemical and Microscopic Examination [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested

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TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 5. Perform semen analysis- Physical, Chemical and Microscopic Examination [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 6. Perform Cerebrospinal Fluid (CSF) examination - Physical, Chemical, and Microscopic Examination [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 7. Perform Sputum Analysis- physical, chemical, and microscopic examination [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 8. Perform Pleural Fluid examination -physical, chemical, and microscopic examination [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 9. Perform Synovial fluid examination- physical, chemical, and microscopic examination [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 10. Perform Peritoneal Fluid examination- physical, chemical and microscopic examination [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 11. Perform Pericardial Fluid examination- physical, chemical, and microscopic examination [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CPAP 12. Operate the automation system used in Clinical pathology [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

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Suggested Readings

1. Godkar, P. B., & Godkar, D. P. (2006). Textbook of medical laboratory technology. Bhalani publishing house.
2. Sood, R. (2006). Textbook of medical laboratory technology. Jaypee Brothers Publishers.
3. Mundt, L., & Shanahan, K. (2020). Graff's textbook of urinalysis and body fluids. Jones & Bartlett Learning.
4. Strasinger, S. K., & Di Lorenzo, M. S. (2014). Urinalysis and body fluids. FA Davis.

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Second Year Mapping Annexure 1
Course-to-Programme-Outcome Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
BMLS-301 Bacteriology	✓	✓				✓	✓				✓		
BMLS-302 Intermediary Metabolism and Endocrinology	✓	✓				✓	✓				✓		
BMLS-303 Clinical Haematology	✓	✓				✓	✓				✓	✓	✓
BMLS-304 Basics of Pharmacology	✓					✓	✓			✓	✓		
BMLS-301 Bacteriology Practical		✓				✓	✓				✓		✓
BMLS-302 Intermediary Metabolism and Endocrinology Practical		✓				✓	✓				✓		
BMLS-303 Clinical Haematology Practical		✓				✓	✓				✓	✓	✓
BMLS-401 Virology and Immunology	✓	✓				✓	✓				✓		
BMLS-402 Genetics and Molecular Biology	✓	✓				✓	✓		✓		✓		
BMLS-403 Clinical Pathology	✓	✓				✓	✓				✓	✓	
BMLS-404 Medical Laboratory Management and Quality Control		✓		✓			✓	✓	✓	✓			✓
BMLS-401 Virology and Immunology Practical		✓				✓	✓				✓		✓
BMLS-402 Genetics and Molecular Biology Practical		✓				✓	✓		✓		✓		
BMLS-403 Clinical Pathology Practical		✓				✓	✓				✓		

A tick indicates the primary developmental contribution of the course to that outcome. It does not restrict the universal applicability of PO1-PO10 and PSO1-PSO3 across the programme.

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Second Year Mapping Annexure 2
Professional-Competency Contribution

Course	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9	PC 10	PC 11	PC 12	PC 13	PC 14	PC 15	PC 16	PC 17	PC 18
BMLS-301 Bacteriology		✓			✓				✓		✓					✓		
BMLS-302 Intermediary Metabolism and Endocrinology					✓				✓							✓		
BMLS-303 Clinical Haematology					✓		✓		✓	✓								
BMLS-304 Basics of Pharmacology					✓				✓							✓		
BMLS-301 Bacteriology Practical		✓	✓		✓		✓				✓							
BMLS-302 Intermediary Metabolism and Endocrinology Practical			✓	✓	✓	✓			✓									
BMLS-303 Clinical Haematology Practical					✓		✓		✓	✓								
BMLS-401 Virology and Immunology					✓				✓		✓					✓		
BMLS-402 Genetics and Molecular Biology					✓				✓			✓				✓	✓	
BMLS-403 Clinical Pathology	✓	✓			✓				✓	✓								
BMLS-404 Medical Laboratory Management and Quality Control				✓		✓	✓	✓				✓						✓
BMLS-401 Virology and Immunology Practical		✓			✓		✓		✓		✓							
BMLS-402 Genetics and Molecular Biology Practical			✓	✓	✓							✓					✓	
BMLS-403 Clinical Pathology Practical	✓	✓			✓	✓			✓									

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Part III - Third-Year BMLS (Semesters V and VI)

Mycology and parasitology, analytical and clinical biochemistry, immunohaematology and transfusion medicine, medical law and ethics, applied pathobiology, cytology and histopathology, and research methodology.

Semester V - Course Structure, Hours and Credits

Sl. No.	Course	Lecture	Tutorial	Practical	Credits	Contact hours
1	BMLS-501 Mycology and Parasitology	4	0	4	6	120
2	BMLS-502 Analytical Biochemistry	4	0	4	6	120
3	BMLS-503 Immunohaematology and Transfusion Medicine	4	0	4	6	120
4	BMLS-504 Medical Law and Ethics	2	0	0	2	30
	Grand Total	**14**	**0**	**12**	**20**	**390**

 # Non-University examination subject (NUES), conducted at the institution level as prescribed by the RGUHS Board of Studies. Prescribed semester totals: 390 contact hours and 20 credits.

Semester V - Examination Scheme

Course	Continuous (internal) assessment	End-semester examination	Total	Status
BMLS-501 Mycology and Parasitology	30	70	100	University
BMLS-502 Analytical Biochemistry	30	70	100	University
BMLS-503 Immunohaematology and Transfusion Medicine	30	70	100	University
BMLS-504 Medical Law and Ethics	30	70	100	University
BMLS-501 Mycology and Parasitology Practical	30	70	100	University
BMLS-502 Analytical Biochemistry Practical	30	70	100	University
BMLS-503 Immunohaematology and Transfusion Medicine Practical	30	70	100	University

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Course	Continuous (internal) assessment	End-semester examination	Total	Status
Grand Total	**210**	**490**	**700**	

Semester V - Course-to-Competency Overview

Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-501 Mycology and Parasitology	Develops understanding of medically important fungi and parasites, their morphology, life cycles, pathogenesis, epidemiology, specimen requirements, laboratory diagnosis and relevant prophylaxis and control.	PO1, PO2, PO6, PO7	PC2, PC5, PC9, PC11, PC16
BMLS-502 Analytical Biochemistry	Develops understanding of the principles, instrumentation, applications and limitations of analytical techniques used in the clinical biochemistry laboratory, including photometry, electrophoresis, chromatography, immunoassay, mass spectrometry and automation.	PO1, PO2, PO6, PO7, PO9	PC4, PC5, PC6, PC7, PC16
BMLS-503 Immunohaematology and Transfusion Medicine	Develops understanding of blood group systems, antigen-antibody reactions in immunohaematology, donor selection and blood collection, component preparation and storage, compatibility testing, transfusion-transmitted infection screening, transfusion reactions, haemolytic disease of the foetus and newborn, and blood-bank regulation and documentation.	PO1, PO2, PO4, PO5, PO6	PC1, PC5, PC7, PC9, PC13, PC14
BMLS-504 Medical Law and Ethics	Develops understanding of medical ethics and bioethics, ethical laboratory and research practice, the Indian legal system, medico-legal records and specimens, relevant health legislation, professional accountability, indemnity and intellectual property rights.	PO4, PO5, PO10	PC12, PC13, PC14, PC15

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Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-501 Mycology and Parasitology Practical	Trains the learner in KOH mounts, fungal culture and lactophenol cotton blue preparations, stool concentration techniques, blood smears for haemoparasites and the identification of medically important fungi and parasites.	PO2, PO6, PO7	PC2, PC3, PC5, PC9, PC11
BMLS-502 Analytical Biochemistry Practical	Trains the learner in the estimation of biochemical parameters on semi-automated analysers and in the demonstration of chromatography, electrophoresis, ELISA, atomic absorption spectroscopy and HPLC.	PO2, PO6, PO7, PO9	PC4, PC5, PC6, PC7
BMLS-503 Immunohaematology and Transfusion Medicine Practical	Trains the learner in ABO and Rh grouping, antibody screening, Coombs testing, compatibility testing, component preparation, donor screening and the documentation required in a licensed blood centre.	PO2, PO4, PO5, PO6	PC1, PC5, PC7, PC9, PC13

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BMLS-501 - Mycology and Parasitology

Course code	BMLS-501	**Course title**	Mycology and Parasitology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC2, PC5, PC9, PC11, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-501 with its corresponding practical course, Mycology and Parasitology Practical. Combined course credit for BMLS-501 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of medically important fungi and parasites, their morphology, life cycles, pathogenesis, epidemiology, specimen requirements, laboratory diagnosis and relevant prophylaxis and control.

Course rationale (NCAHP): Students will gain comprehensive knowledge of medically important fungi and parasites, including their classification, morphology, pathogenesis, and laboratory diagnosis.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
MP-CO1	Identify clinically significant fungi and parasites that cause human disease.	K	L1 Remember	PO1, PO2, PO6, PO7 PC2, PC5, PC9, PC11, PC16
MP-CO2	Describe the pathogenesis, clinical features, and modes of transmission of common infectious diseases.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC2, PC5, PC9, PC11, PC16

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
MP-CO3	Demonstrate proper techniques for specimen collection, handling, and processing in a clinical laboratory.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC2, PC5, PC9, PC11, PC16
MP-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC2, PC5, PC9, PC11, PC16
MP-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC2, PC5, PC9, PC11, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

U

nit distribution and hours

Unit	Topic	Hours
1	Introduction to Mycology: Taxonomy and classification of various medically important fungi, Characteristic features of fungi, reproductive methods of fungi, Normal fungal...	4
2	Superficial mycoses- general characteristics of superficial mycoses Morphology, pathogenesis, laboratory diagnosis, and treatment of Piedra, Malassezia, Dermatophytoses, ...	15
3	Mycotoxicosis: Definition of Mycotoxin, Mycetismus, Method of Mycotoxins, preventive measures and treatment	4
4	Common fungal laboratory contaminants, Culture media used in mycology, Direct microscopy examination of fungi, Processing of clinical samples for diagnosis of fungal infe...	7
5	Introduction of arthropods: Define and classify the arthropods of importance in public health. The sources and modes of transmission of infections are contaminated soil a...	4
6	Protozoology/ Protozoal parasites: General characteristics of protozoa. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection, laboratory diagnosi...	6
7	Helminthology/ Helminthic parasites: Platyhelminthes: General characters of Platyhelminths. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection,...	7
8	Nemathelminthes: General characters of Nemathelminthes, Geographical distribution, Habitat, Morphology, life cycle, Mode of infection, laboratory diagnosis, treatment and...	8
9	Laboratory diagnosis of parasitic diseases: Collection, preparation of specimens for the diagnosis of parasitic infection- Stool, Blood, Urine, sputum, Cerebrospinal flui...	5
	Total	**60**

Unit 1 (4 hours)

MP 1.1. Introduction to Mycology: Taxonomy and classification of various medically important fungi, Characteristic features of fungi, reproductive

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methods of fungi, Normal fungal flora; Classification of mycoses [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (15 hours)

MP 2.1. Superficial mycoses- general characteristics of superficial mycoses Morphology, pathogenesis, laboratory diagnosis, and treatment of Piedra, Malassezia, Dermatophytoses, and Subcutaneous mycoses are the general characteristics of subcutaneous mycoses [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MP 2.2. Morphology, cultural characteristics, pathogenesis and lab diagnosis and treatment of Mycotic mycetoma, Sporotrichosis, Chromoblastomycoses, Subcutaneous phycomycosis, Rhinosporidiosis, Lobomycosis Systemic Mycoses -general characteristics of opportunistic systemic mycoses- Histoplasmosis, Blastomycosis, Coccidioidomycosis, Paracoccidioidomycosis General characteristics of opportunistic systemic mycoses- Morphology, cultural characteristics, pathogenesis and lab diagnosis and treatment of Candidiasis, Cryptococcosis, Aspergillosis, Penicillosis, Mucormycosis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (4 hours)

MP 3.1. Mycotoxicosis: Definition of Mycotoxin, Mycetismus, Method of Mycotoxins, preventive measures and treatment [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (7 hours)

MP 4.1. Common fungal laboratory contaminants, Culture media used in mycology, Direct microscopy examination of fungi, Processing of clinical samples for diagnosis of fungal infections i.e [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MP 4.2. Skin, nail, hair, pus, sputum, CSF and other body fluids, Techniques used for isolation and identification of medically important fungi, Antifungal susceptibility tests, preservation of fungal cultures, Routine myco- serological

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tests and skin tests [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (4 hours)

MP 5.1. Introduction of arthropods: Define and classify the arthropods of importance in public health [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MP 5.2. The sources and modes of transmission of infections are contaminated soil and water, foods, and vectors [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MP 5.3. Role of arthropods in the transmission of diseases Insects of medical importance: Morphology, life cycle, disease transmitted and control of Mosquitoes, Tse-tse fly, Fleas, Ticks, Housefly, Sand fly, Types of animal association- parasitism, commensalism, symbiosis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (6 hours)

MP 6.1. Protozoology/ Protozoal parasites: General characteristics of protozoa. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection, laboratory diagnosis, treatment and prevention of [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MP 6.2. Amoebae (Entamoeba histolytica, non-pathogenic amoebae) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MP 6.3. Flagellates (Trichomonas, Giardia lamblia, Trypanosoma, Leishmania) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MP 6.4. Sporozoa (Plasmodium species, Toxoplasma species) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 7 (7 hours)

MP 7.1. Helminthology/ Helminthic parasites: Platyhelminthes: General characters of Platyhelminths [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MP 7.2. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection, laboratory diagnosis, treatment and prevention of Cestodes (Diphyllobothrium, Taenia, Echinococcus, Hymenolepis) - Trematodes (Schistosoma, Fasciola, Fasciolopsis, Clonorchis and Paragonimus) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 8 (8 hours)

MP 8.1. Nemathelminthes: General characters of Nemathelminthes, Geographical distribution, Habitat, Morphology, life cycle, Mode of infection, laboratory diagnosis, treatment and prevention of Nematodes (Ascaris lumbricoides, Ancylostoma duodenale, Strongyloides stercoralis, Trichinella spiralis, Enterobius vermicularis, Trichuris trichura, Wuchereria bancrofti and Dracunculus medinensis) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 9 (5 hours)

MP 9.1. Laboratory diagnosis of parasitic diseases: Collection, preparation of specimens for the diagnosis of parasitic infection- Stool, Blood, Urine, sputum, Cerebrospinal fluid (CSF), Tissue and aspirates, Genital specimens Examination of Stool for parasites - intestinal protozoal infections, Macroscopic and microscopic examination of stool samples, Staining methods, i.e [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MP 9.2. Iodine staining and permanent staining, Concentration methods- Principles and applications, Chemical examination of stool, Occult blood, Bile pigment Examination of blood for parasites- Staining, examination of thin and thick blood film Immunology and Serology Tests- Skin Test, Animal Xenodiagnosis, Inoculation, Imaging and Haematology [Competency: K/KH |

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Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

BMLS-502 - Analytical Biochemistry

Course code	BMLS-502	**Course title**	Analytical Biochemistry
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7, PO9
Primary competency alignment	PC4, PC5, PC6, PC7, PC16	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-502 with its corresponding practical course, Analytical Biochemistry Practical. Combined course credit for BMLS-502 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of the principles, instrumentation, applications and limitations of analytical techniques used in the clinical biochemistry laboratory, including photometry, electrophoresis, chromatography, immunoassay, mass spectrometry and automation.

Course rationale (NCAHP): Students will gain knowledge on the principles and uses of analytical instruments such as photometry, chromatography, electrophoresis and automation used in Clinical laboratories or Research labs

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
AB-CO1	Understand the principles and applications of common analytical techniques used in biochemistry.	KH	L2 Understand	PO1, PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7, PC16

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
AB-CO2	Demonstrate the ability to prepare samples and use laboratory instruments accurately for biochemical analysis.	SH	L3 Apply	PO1, PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7, PC16
AB-CO3	Apply quantitative and qualitative techniques to analyse biomolecules such as proteins, nucleic acids, carbohydrates, and lipids.	KH	L3 Apply	PO1, PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7, PC16
AB-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7, PC16
AB-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7, PC16

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination

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- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Photometry: Theory of colourimetry, Beer-Lambert's law, Principles and applications of colourimetry, spectrophotometry, atomic absorption Spectroscopy, Fluorimetry a...	10
2	Centrifugation: Basic principles and units of centrifugation, Types of centrifugation and centrifuges, Rotors and tubes, Safety and maintenance, Applications of centrifug...	4
3	Chromatography: Principles, types, Components and applications of Chromatography – Paper Chromatography, TLC, Ion Exchange, Affinity Gel Filtration, Gas Chromatography an...	10
4	Electrophoresis: Principles, Types and applications – Agarose gel, Cellulose acetate and PAGE, and capillary electrophoresis. Electrophoresis of serum and urine protein, ...	10
5	Osmometry: Principle and role of osmometry in clinical laboratory	6
6	Radioactivity: Introduction, properties of alpha, beta and gamma radiations, radioisotopes, measurement of radioactivity, radiation hazards, radiation safety and precauti...	6
7	Types of immunoassays and their principle: Competitive and Non-competitive, immunometric assay and Turbidometry. RIA, ELISA, FIA and ECLIA	8
8	Automation: Principle of Automation, Semi-automated and fully automated chemistry analyser used in a clinical laboratory	6
	Total	**60**

Unit 1 (10 hours)

AB 1.1. Photometry: Theory of colourimetry, Beer-Lambert's law, Principles and applications of colourimetry, spectrophotometry, atomic absorption Spectroscopy, Fluorimetry and flame photometry in clinical laboratory [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM:

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interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (4 hours)

AB 2.1. Centrifugation: Basic principles and units of centrifugation, Types of centrifugation and centrifuges, Rotors and tubes, Safety and maintenance, Applications of centrifugation in the laboratory [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (10 hours)

AB 3.1. Chromatography: Principles, types, Components and applications of Chromatography – Paper Chromatography, TLC, Ion Exchange, Affinity Gel Filtration, Gas Chromatography and HPLC in the laboratory [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (10 hours)

AB 4.1. Electrophoresis: Principles, Types and applications – Agarose gel, Cellulose acetate and PAGE, and capillary electrophoresis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

AB 4.2. Electrophoresis of serum and urine protein, lipoprotein and isoenzymes [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (6 hours)

AB 5.1. Osmometry: Principle and role of osmometry in clinical laboratory [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (6 hours)

AB 6.1. Radioactivity: Introduction, properties of alpha, beta and gamma radiations, radioisotopes, measurement of radioactivity, radiation hazards, radiation safety and precaution, Uses of radioisotopes [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 7 (8 hours)

AB 7.1. Types of immunoassays and their principle: Competitive and Non-competitive, immunometric assay and Turbidometry. RIA, ELISA, FIA and ECLIA [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 8 (6 hours)

AB 8.1. Automation: Principle of Automation, Semi-automated and fully automated chemistry analyser used in a clinical laboratory [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-503 - Immunohaematology and Transfusion Medicine

Course code	BMLS-503	**Course title**	Immunohaematology and Transfusion Medicine
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO4, PO5, PO6
Primary competency alignment	PC1, PC5, PC7, PC9, PC13, PC14	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-503 with its corresponding practical course, Immunohaematology and Transfusion Medicine Practical. Combined course credit for BMLS-503 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of blood group systems, antigen-antibody reactions in immunohaematology, donor selection and blood collection, component preparation and storage, compatibility testing, transfusion-transmitted infection screening, transfusion reactions, haemolytic disease of the foetus and newborn, and blood-bank regulation and documentation.

Course rationale (NCAHP): Students will learn about blood grouping and blood transfusion. The students will learn about the concept of blood grouping, compatibility testing in blood transfusion, and screening of donated blood for various infectious diseases.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
IHTM-CO1	Understand the principles of immunohematology, including blood group systems and their clinical significance.	KH	L2 Understand	PO1, PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13, PC14

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
IHTM-CO2	Demonstrate knowledge of donor selection, blood collection, processing, storage, and component preparation.	SH	L3 Apply	PO1, PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13, PC14
IHTM-CO3	Perform routine blood grouping, cross-matching, antibody screening, and compatibility testing using standard laboratory techniques.	SH	L3 Apply	PO1, PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13, PC14
IHTM-CO4	Apply safety and quality control procedures in all aspects of blood banking and transfusion services.	KH	L3 Apply	PO1, PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13, PC14
IHTM-CO5	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13, PC14
IHTM-CO6	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13, PC14

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay

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SURGERY/ORTHOPEDICS/OTORHINOLARYNGOLOGY/OPHTHALMOLOGY/DENTISTRY/ORAL AND MAXILLOFACIAL SURGERY/PERIODONTOLOGY/ORTHODONTICS/PROSTHODONTICS/CONSERVATIVE DENTISTRY/PEDIATRIC DENTISTRY/ORAL MEDICINE AND RADIOLOGY/ORAL PATHOLOGY/PUBLIC HEALTH DENTISTRY/DENTAL MATERIALS/DENTAL ANATOMY/DENTAL PHYSIOLOGY/DENTAL BIOCHEMISTRY/DENTAL PHARMACOLOGY/DENTAL PATHOLOGY/DENTAL MICROBIOLOGY/DENTAL ANESTHESIOLOGY/DENTAL RADIOLOGY/DENTAL PUBLIC HEALTH/DENTAL HOSPITAL ADMINISTRATION/DENTAL EDUCATION/DENTAL TECHNOLOGY/DENTAL HYGIENE/DENTAL ASSISTANT/DENTAL MECHANIC/DENTAL LABORATORY TECHNOLOGY/DENTAL X-RAY TECHNOLOGY/DENTAL ANESTHESIA TECHNOLOGY/DENTAL OPERATION THEATRE TECHNOLOGY/DENTAL RECORDS/DENTAL LABORATORY TECHNOLOGY/DENTAL RADIOLOGY/DENTAL RADIOTHERAPY/DENTAL CARDIOLOGY TECHNOLOGY/DENTAL PERFUSION TECHNOLOGY/DENTAL DIALYSIS TECHNOLOGY/DENTAL CRITICAL CARE TECHNOLOGY/DENTAL EMERGENCY MEDICAL TECHNOLOGY/DENTAL OPTOMETRY/DENTAL PHYSIOTHERAPY/DENTAL OCCUPATIONAL THERAPY/DENTAL SPEECH AND HEARING/DENTAL 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Unit 1 (10 hours)

IHTM 1.1. History of transfusion, Types of blood bags and their advantages and disadvantages, Blood donor selection criteria and donor preparation for collection, Autologous transfusion: Types of autologous blood collection, Hemapheresis: pertaining to Leucocytes, platelets and plasma, Donor adverse reaction and its management [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (10 hours)

IHTM 2.1. History and discovery of various blood group systems, Genetics and inheritance of the ABO blood group system, Weak variants of the ABO blood groups, Bombay phenotype, Other phenotypes [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

IHTM 2.2. Rh blood group system, weak D, Rh null, Rh mod [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (12 hours)

IHTM 3.1. Components of blood for transfusion- Packed red cells, washed red cells, frozen Red cells, platelet-rich plasma (PRP), Platelet concentrate and frozen platelets [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

IHTM 3.2. Fresh plasma (FP), Fresh Frozen Plasma (FFP) and cryoprecipitate, process of component preparation, storage, indications, transfusion dosage, and quality control [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (12 hours)

IHTM 4.1. Transfusion reactions- causes, clinical features, management and laboratory investigation, Pretransfusion tests and their clinical significance [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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IHTM 4.2. Compatibility test in blood transfusion: Collection of blood for cross-matching from a blood bag, Major cross-matching, Minor cross-matching, use of enzymes in the blood bank, especially Papain [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (6 hours)

IHTM 5.1. Transfusion-transmitted diseases and their laboratory investigations. Hemolytic disease of the newborn (HDN) and its investigations [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (5 hours)

IHTM 6.1. HLA Human Leucocytic antigen, Introduction to basic concepts of HLA and clinical applications of HLA testing, Techniques and principles of histocompatibility testing [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (5 hours)

IHTM 7.1. Regulatory agency that governs activities in the blood bank, Total quality management in transfusion service, including premises, personnel, instruments and reagents, Biosafety, external/internal quality control in Transfusion Medicine [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-504 - Medical Law and Ethics

Course code	BMLS-504	**Course title**	Medical Law and Ethics
Hours	Lecture 2 | Tutorial 0 | Practical 0 | Total contact hours 30	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO4, PO5, PO10
Primary competency alignment	PC12, PC13, PC14, PC15	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

Subject Description

Develops understanding of medical ethics and bioethics, ethical laboratory and research practice, the Indian legal system, medico-legal records and specimens, relevant health legislation, professional accountability, indemnity and intellectual property rights.

Course rationale (NCAHP): Students are formulated to impart the basic concept of medical ethics, guidelines about human ethics, and animal ethics. Students will also learn about the Indian legal system, medico-legal cases and essential acts.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
MLE-CO1	Comprehend knowledge of medical and bioethics.	KH	L2 Understand	PO4, PO5, PO10 PC12, PC13, PC14, PC15
MLE-CO2	Follow good laboratory practice and appropriate ethical guidelines while conducting research on animal and human samples.	K/KH	L1-L2 Remember - Understand	PO4, PO5, PO10 PC12, PC13, PC14, PC15

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
MLE-CO3	Understand the Indian Legal system, medico legal records, human rights act, disaster management, Human Organ Transplantation Act, mental Health act, professional indemnity insurance policy and IPR.	KH	L2 Understand	PO4, PO5, PO10 PC12, PC13, PC14, PC15
MLE-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO4, PO5, PO10 PC12, PC13, PC14, PC15
MLE-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO4, PO5, PO10 PC12, PC13, PC14, PC15

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Introduction to medical ethics and bioethics: definition and scope of ethics, morality and law. Principles of biomedical ethics - autonomy, beneficence, non-maleficence a…	5
2	Ethics in laboratory practice: informed consent for testing, patient rights and dignity, confidentiality and privacy of laboratory data, conflict of interest, truthful re…	5
3	Research ethics: ICMR National Ethical Guidelines for biomedical and health research involving human participants, Institutional Ethics Committee and Institutional Review…	6
4	Indian legal system and medico-legal aspects: structure of courts, evidence and testimony, medico-legal records and reports, medico-legal specimens, chain of custody, pre…	6
5	Relevant legislation: Clinical Establishments Act, Human Organ and Tissue Transplantation Act, Mental Healthcare Act, HIV and AIDS (Prevention and Control) Act, PC-PNDT A…	5
6	Professional accountability and rights: negligence and malpractice, professional indemnity insurance, human rights, disaster management responsibilities of the laboratory…	3
	Total	**30**

Unit 1 (5 hours)

MLE 1.1. Introduction to medical ethics and bioethics: definition and scope of ethics, morality and law [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MLE 1.2. Principles of biomedical ethics - autonomy, beneficence, non-maleficence and justice [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MLE 1.3. Professional codes of conduct for allied and healthcare professionals. Ethical obligations of the medical laboratory professional

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[Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (5 hours)

MLE 2.1. Ethics in laboratory practice: informed consent for testing, patient rights and dignity, confidentiality and privacy of laboratory data, conflict of interest, truthful reporting, good clinical laboratory practice and ethical use of residual samples [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (6 hours)

MLE 3.1. Research ethics: ICMR National Ethical Guidelines for biomedical and health research involving human participants, Institutional Ethics Committee and Institutional Review Board, informed consent in research, vulnerable participants [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

MLE 3.2. Animal ethics and CPCSEA guidelines. Scientific misconduct, plagiarism, authorship and publication ethics [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (6 hours)

MLE 4.1. Indian legal system and medico-legal aspects: structure of courts, evidence and testimony, medico-legal records and reports, medico-legal specimens, chain of custody, preservation and despatch of samples, laboratory professional as a witness [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (5 hours)

MLE 5.1. Relevant legislation: Clinical Establishments Act, Human Organ and Tissue Transplantation Act, Mental Healthcare Act, HIV and AIDS (Prevention and Control) Act, PC-PNDT Act, Drugs and Cosmetics Rules applicable to blood centres, Consumer Protection Act and the Biomedical Waste Management Rules [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-501 - Mycology and Parasitology Practical

Course code	BMLS-501	**Course title**	Mycology and Parasitology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC2, PC3, PC5, PC9, PC11	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-501 with its corresponding theory course, Mycology and Parasitology. Combined course credit for BMLS-501 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in KOH mounts, fungal culture and lactophenol cotton blue preparations, stool concentration techniques, blood smears for haemoparasites and the identification of medically important fungi and parasites.

Course rationale (NCAHP): Students would be able to identify various fungal strains and parasites. Students will also be correlated with the diseases associated with them. 1. Collection, transport and processing of various clinical specimens for fungal culture - Skin, nail, hair, pus, sputum, CSF and other body fluids and secretions 2. Prepare culture media, reagents and stains used for fungal analysis 3. Perform KOH preparation, Gram stain, Potassium Hydroxide - Calcofluor White method, India Ink preparation, Modified Kinyoun Acid Fast Stain for Nocardia, Lactophenol Cotton Blue preparation 4. Identification of pathogenic fungi - yeast, moulds, dimorphism in fungi 5. Perform stool examination for the detection of intestinal parasites with concentration methods- sedimentation and floatation methods 6. Identify adult worms, ova, and hemoparasites from slides or models 7. Examination of blood smears for hemoparasites. *Clinical laboratory rotation/observation can be incorporated wherever possible

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Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
MPP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the mycology and parasitology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC9, PC11
MPP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC9, PC11
MPP-CO3	Perform the prescribed procedures in mycology and parasitology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC9, PC11
MPP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC2, PC3, PC5, PC9, PC11
MPP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC2, PC3, PC5, PC9, PC11
MPP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC9, PC11

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise

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- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

MPP 1. Collection, transport and processing of various clinical specimens for fungal culture - Skin, nail, hair, pus, sputum, CSF and other body fluids and secretions [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

MPP 2. Prepare culture media, reagents and stains used for fungal analysis [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

MPP 3. Perform KOH preparation, Gram stain, Potassium Hydroxide - Calcofluor White method, India Ink preparation, Modified Kinyoun Acid Fast Stain for Nocardia, Lactophenol Cotton Blue preparation [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

MPP 4. Identification of pathogenic fungi - yeast, moulds, dimorphism in fungi [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

MPP 5. Perform stool examination for the detection of intestinal parasites with concentration methods- sedimentation and floatation methods [Competency:

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SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

MPP 6. Identify adult worms, ova, and hemoparasites from slides or models [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

MPP 7. Examination of blood smears for hemoparasites. [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. Jagdish Chander – Textbook of Medical Mycology, Jaypee Brothers Medical Publishers
2. George S. Fischer – Fundamentals of Diagnostic Mycology
3. C.K. Jayaram Paniker, Paniker's Textbook of Medical Parasitology, Jaypee Brothers Medical Publishers
4. D.R. Arora & B. Arora – Medical Parasitology, CBS Publishers & Distributors
5. P. Chakraborty – Textbook of Medical Parasitology, New Central Book Agency
6. Lynne Shore Garcia – Diagnostic Medical Parasitology, ASM Press
7. K.D. Chatterjee – Parasitology in Relation to Clinical Medicine, CBS Publishers & Distributors
8. J.G. Collee, A.G. Fraser, B.P. Marmion, A. Simmons – Mackie & McCartney Practical Medical Microbiology, Elsevier
9. Praful B. Godkar – Textbook of Medical Microbiology and Parasitology, Bhalani Publishing House
10. K. Park – Park's Textbook of Preventive and Social Medicine, Banarsidas Bhanot Publishers

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BMLS-502 - Analytical Biochemistry Practical

Course code	BMLS-502	**Course title**	Analytical Biochemistry Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7, PO9
Primary competency alignment	PC4, PC5, PC6, PC7	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-502 with its corresponding theory course, Analytical Biochemistry. Combined course credit for BMLS-502 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in the estimation of biochemical parameters on semi-automated analysers and in the demonstration of chromatography, electrophoresis, ELISA, atomic absorption spectroscopy and HPLC.

Course rationale (NCAHP): Students will be equipped with various diagnostic tests and hands-on experience in a semi-automated analyser. 1. Estimation of biochemical parameters using a Semi-automatic analyser a. Plasma Glucose b. Serum protein c. Serum Albumin d. Serum Urea e. Serum Uric acid f. Serum Creatinine 2. Demonstration of Analytical Techniques a. Thin-layer chromatography b. Serum protein electrophoresis c. ELISA d. AAS e. HPLC 3. Paper chromatography and staining techniques *Clinical laboratory rotation/observation can be incorporated wherever possible

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Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
ABP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the analytical biochemistry laboratory.	SH/P	L3 Apply	PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7
ABP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7
ABP-CO3	Perform the prescribed procedures in analytical biochemistry accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7
ABP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7
ABP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7
ABP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7, PO9 PC4, PC5, PC6, PC7

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis

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- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

ABP 1. Estimation of biochemical parameters using a Semi-automatic analyser a. Plasma Glucose b. Serum protein c. Serum Albumin d. Serum Urea e. Serum Uric acid f. Serum Creatinine [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

ABP 2. Demonstration of Analytical Techniques a. Thin-layer chromatography b. Serum protein electrophoresis c. ELISA d. AAS e. HPLC [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

ABP 3. Paper chromatography and staining techniques [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. Wilson and walker's Principles and techniques of biochemistry and molecular biology, Cambridge university press.
2. U. Sathyanarayana – Biochemistry, Elsevier

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3. Robert K. Murray et al. – Harper's Illustrated Biochemistry, Tata McGraw-Hill
4. M.N. Chatterjee & Rana Shinde – Textbook of Medical Biochemistry, Jaypee
5. Alan Gowenlock – Varley's Practical Clinical Biochemistry, CBS
6. Textbook of Clinical Chemistry by Teitz

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BMLS-503 - Immunohaematology and Transfusion Medicine Practical

Course code	BMLS-503	**Course title**	Immunohaematology and Transfusion Medicine Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO4, PO5, PO6
Primary competency alignment	PC1, PC5, PC7, PC9, PC13	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-503 with its corresponding theory course, Immunohaematology and Transfusion Medicine. Combined course credit for BMLS-503 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in ABO and Rh grouping, antibody screening, Coombs testing, compatibility testing, component preparation, donor screening and the documentation required in a licensed blood centre.

Course rationale (NCAHP): Students will gain practical knowledge in donor selection, phlebotomy, and managing donor reactions. They will be trained in pre-transfusion testing, investigating transfusion reactions, and diagnosing hemolytic disease of the fetus and newborn. The course also equips them with skills in blood collection, disease prevention, laboratory investigations, and interpretation of results. 1. Demonstrate the procedure for pooled cell preparation 2. Demonstrate the preparation of 5% cell suspension 3. Demonstrate the preparation of sensitised cells 4. Demonstrate the procedure for cell washing 5. Perform ABO and Rh grouping: a. Direct (preliminary) and indirect (proof) grouping. b. Rh grouping and Du determination. 6. Demonstrate Antibody screening: a. Forward (cell) grouping b. Reverse (serum) grouping 7. Donor Screening and Blood Collection 8. Preservation of blood for transfusion 9. Cross-matching:

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Major and minor cross-matching. 10. Coombs test: Direct and indirect Coombs test 11. Preparation of blood components *Clinical laboratory rotation/observation can be incorporated wherever possible

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
IHTM P-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the immunohaematology and transfusion medicine laboratory.	SH/P	L3 Apply	PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13
IHTM P-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13
IHTM P-CO3	Perform the prescribed procedures in immunohaematology and transfusion medicine accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13
IHTM P-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13
IHTM P-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13
IHTM P-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO4, PO5, PO6 PC1, PC5, PC7, PC9, PC13

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)

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- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

IHTMP 1. Demonstrate the procedure for pooled cell preparation [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IHTMP 2. Demonstrate the preparation of 5% cell suspension [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IHTMP 3. Demonstrate the preparation of sensitised cells [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IHTMP 4. Demonstrate the procedure for cell washing [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IHTMP 5. Perform ABO and Rh grouping: a. Direct (preliminary) and indirect (proof) grouping. b. Rh grouping and Du determination. [Competency: SH/P |

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Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IHTMP 6. Demonstrate Antibody screening: a. Forward (cell) grouping b. Reverse (serum) grouping [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IHTMP 7. Donor Screening and Blood Collection [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IHTMP 8. Preservation of blood for transfusion [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IHTMP 9. Cross-matching: Major and minor cross-matching. [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IHTMP 10. Coombs test: Direct and indirect Coombs test [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

IHTMP 11. Preparation of blood components [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. Mamak, N., & Aytekin, İ. (2012). Principles of Blood Transfusion. Blood Cell-An Overview of Studies in Hematology.
2. AABB. (2017). Technical manual (19th ed.). AABB.
3. Sood, R. (2006). Textbook of medical laboratory technology. Jaypee Brothers Publishers.
4. Godkar, P. B., & Godkar, D. P. (2006). Textbook of medical laboratory technology. Bhalani publishing house.
5. Klein, H. G., & Anstee, D. J. (2013). Mollison's blood transfusion in clinical medicine. John Wiley & Sons.
6. Harmening, D. M. (2018). Modern blood banking & transfusion practices. FA Davis. SEMESTER VI

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Semester VI - Course Structure, Hours and Credits

Sl. No.	Course	Lecture	Tutorial	Practical	Credits	Contact hours
1	BMLS-601 Applied Pathobiology	4	0	4	6	120
2	BMLS-602 Cytology and Histopathology	4	0	4	6	120
3	BMLS-603 Clinical Biochemistry	4	0	4	6	120
4	BMLS-604 Biostatistics and Research Methodology	2	0	0	2	30
	Grand Total	**14**	**0**	**12**	**20**	**390**

 # Non-University examination subject (NUES), conducted at the institution level as prescribed by the RGUHS Board of Studies. Prescribed semester totals: 390 contact hours and 20 credits.

Semester VI - Examination Scheme

Course	Continuous (internal) assessment	End-semester examination	Total	Status
BMLS-601 Applied Pathobiology	30	70	100	University
BMLS-602 Cytology and Histopathology	30	70	100	University
BMLS-603 Clinical Biochemistry	30	70	100	University
BMLS-604 Biostatistics and Research Methodology	30	70	100	University
BMLS-602 Cytology and Histopathology Practical	30	70	100	University
BMLS-603 Clinical Biochemistry Practical	30	70	100	University
BMLS-601 Applied Pathobiology Practical	30	70	100	University
Grand Total	**210**	**490**	**700**	

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Semester VI - Course-to-Competency Overview

Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-601 Applied Pathobiology	Develops understanding of cell injury and adaptation, inflammation and repair, haemodynamic disorders, immunopathology, neoplasia and the systemic and molecular basis of disease, integrating laboratory findings with disease mechanisms.	PO1, PO2, PO6, PO7	PC5, PC9, PC16, PC17
BMLS-602 Cytology and Histopathology	Develops understanding of tissue and cytology specimen handling, fixation, processing, embedding, microtomy, routine and special staining, immunohistochemistry, frozen sections, exfoliative and aspiration cytology, cytopreparatory techniques and laboratory quality assurance in histopathology.	PO1, PO2, PO6, PO7	PC2, PC5, PC8, PC9, PC10
BMLS-603 Clinical Biochemistry	Develops understanding of good clinical laboratory practice across the pre-analytical, analytical and post-analytical phases and of organ function tests, including the laboratory diagnosis of diabetes mellitus and liver, renal, gastric, thyroid and cardiac function testing and the biochemistry of cancer.	PO1, PO2, PO6, PO7	PC5, PC6, PC7, PC9, PC10
BMLS-604 Biostatistics and Research Methodology	Develops understanding of descriptive and inferential statistics, sampling, study designs, data collection and presentation, tests of significance, research ethics and scientific writing relevant to laboratory research.	PO6, PO7, PO9, PO10	PC16, PC17, PC12
BMLS-602 Cytology and Histopathology Practical	Trains the learner in grossing assistance, tissue processing, embedding, microtomy, H&E and special staining, frozen-section assistance, cytology smear preparation and Papanicolaou staining, and slide filing and archiving.	PO2, PO6, PO7	PC2, PC3, PC5, PC8, PC10

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Course	Foundational contribution	Primary programme outcomes	Primary professional competencies
BMLS-603 Clinical Biochemistry Practical	Trains the learner in organ-function test profiles on automated and semi-automated analysers, quality-control charting, calibration verification and the interpretation and reporting of clinical biochemistry results.	PO2, PO6, PO7	PC4, PC5, PC6, PC7, PC9
BMLS-601 Applied Pathobiology Practical	Trains the learner to correlate gross and microscopic pathology with laboratory findings through slide and specimen study, case-based interpretation and structured reporting.	PO2, PO6, PO7	PC5, PC9, PC16, PC17

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BMLS-601 - Applied Pathobiology

Course code	BMLS-601	**Course title**	Applied Pathobiology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC5, PC9, PC16, PC17	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-601 with its corresponding practical course, Applied Pathobiology Practical. Combined course credit for BMLS-601 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of cell injury and adaptation, inflammation and repair, haemodynamic disorders, immunopathology, neoplasia and the systemic and molecular basis of disease, integrating laboratory findings with disease mechanisms.

Course rationale (NCAHP): This course provides an in-depth study of the cellular and tissue-level mechanisms that underlie disease processes. It covers key principles of cell injury, inflammation, healing, immune pathology, and neoplasia, with an emphasis on histopathological changes and their clinical implications.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
AP-CO1	Understand the fundamental concepts of disease processes, including cell injury, inflammation, repair, and neoplasia.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC9, PC16, PC17

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
AP-CO2	Explain the mechanisms of cellular adaptation, degeneration, necrosis, apoptosis, and other pathological changes.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC9, PC16, PC17
AP-CO3	Apply knowledge of general pathology to interpret basic histological findings and laboratory results relevant to common diseases.	KH/SH	L4 Analyze	PO1, PO2, PO6, PO7 PC5, PC9, PC16, PC17
AP-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC5, PC9, PC16, PC17
AP-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC5, PC9, PC16, PC17

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination

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- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Introduction to Pathobiology & Cell Injury: Definition and scope of pathology, Cellular adaptations: hypertrophy, hyperplasia, atrophy, metaplasia, Mechanisms of cell…	8
2	Inflammation and Repair: Definition and symptoms, Acute inflammation: signs, vascular and cellular events, Chemical mediators of inflammation, Chronic inflammation and gr…	12
3	Hemodynamic and Immune Disorders: Edema, hyperemia, haemorrhage, thrombosis, embolism, infarction, Difference between transudate and exudate, Shock: types and pathology, …	12
4	Neoplasia: Definitions and nomenclature of tumours, Differences between benign and malignant tumours, Histological features: anaplasia, differentiation, invasion, carcino…	16
5	Infectious and Parasitic Diseases: Anthrax, Whooping Cough (Pertussis), Candidiasis, Amoebiasis, Malaria, TORCH Complex, Hepatitis type laboratory diagnosis, Pulmonary tu…	12
	Total	**60**

Unit 1 (8 hours)

AP 1.1. Introduction to Pathobiology & Cell Injury: Definition and scope of pathology, Cellular adaptations: hypertrophy, hyperplasia, atrophy, metaplasia, Mechanisms of cell injury: physical, chemical, biological, Morphology of reversible and irreversible injury, Cell death: necrosis (types), apoptosis, Intracellular accumulations – Lipids, cholesterol, proteins, glycogen and pigments; examples, Pathologic calcification – Types and examples [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 2 (12 hours)

AP 2.1. Inflammation and Repair: Definition and symptoms, Acute inflammation: signs, vascular and cellular events, Chemical mediators of inflammation, Chronic inflammation and granuloma formation, Healing: Regeneration and fibrosis, wound healing stages, factors affecting wound healing [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (12 hours)

AP 3.1. Hemodynamic and Immune Disorders: Edema, hyperemia, haemorrhage, thrombosis, embolism, infarction, Difference between transudate and exudate, Shock: types and pathology, Hypersensitivity reactions (I–IV), autoimmunity: examples (SLE, rheumatoid arthritis), Diabetes, HIV, Tuberculosis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (16 hours)

AP 4.1. Neoplasia: Definitions and nomenclature of tumours, Differences between benign and malignant tumours, Histological features: anaplasia, differentiation, invasion, carcinogenesis: chemical, radiation, and viral, mode of tumour spread, Clinical aspects of neoplasia, grading and stages of tumour, Tumour markers and lab diagnosis (AFP, PSA, CEA, etc.) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (12 hours)

AP 5.1. Infectious and Parasitic Diseases: Anthrax, Whooping Cough (Pertussis), Candidiasis, Amoebiasis, Malaria, TORCH Complex, Hepatitis type laboratory diagnosis, Pulmonary tuberculosis and lab diagnosis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-602 - Cytology and Histopathology

Course code	BMLS-602	**Course title**	Cytology and Histopathology
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC2, PC5, PC8, PC9, PC10	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-602 with its corresponding practical course, Cytology and Histopathology Practical. Combined course credit for BMLS-602 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of tissue and cytology specimen handling, fixation, processing, embedding, microtomy, routine and special staining, immunohistochemistry, frozen sections, exfoliative and aspiration cytology, cytopreparatory techniques and laboratory quality assurance in histopathology.

Course rationale (NCAHP): Students will develop a comprehensive understanding of the principles and practices in Cytology and Histopathology. Students will also learn about the organisation of laboratories, specimen collection and processing, cytological and histological techniques, routine and special staining methods, and the interpretation of cellular and tissue morphology.

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Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CHI-CO1	Understand the principles and techniques involved in the preparation, fixation, processing, and staining of tissue and cytological specimens.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC2, PC5, PC8, PC9, PC10
CHI-CO2	Demonstrate proper techniques for specimen collection, labelling, and handling to preserve diagnostic quality.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC2, PC5, PC8, PC9, PC10
CHI-CO3	Perform routine and special staining techniques used in histopathology and cytopathology.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC2, PC5, PC8, PC9, PC10
CHI-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC2, PC5, PC8, PC9, PC10
CHI-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC2, PC5, PC8, PC9, PC10

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

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Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Introduction to Cytology: Definition of cytology, organisation of cytology laboratory, Types of cytology, Cytological sampling techniques, Sample acceptance and rejection…	5
2	Exfoliative Cytology: Cervical cytology, Fluid cytology-Urinary tract, Respiratory system, CSF, Body fluids. Sex chromatin demonstration and karyotyping, Vital staining f…	10
3	Automation in Cytology: Liquid-based cytology: principles and preparation, Molecular cytology, Cell block technique	5
4	Introduction to histopathology laboratory: Definition of biopsy and autopsy, Types of tissues received, Storage and documentation, Steps in tissue preparation, Grossing p…	6
5	Fixatives: Definition and classification, Qualities of ideal fixatives, Common fixatives used, Methods of fixation, Methods for removing excess fixative	4
6	Tissue processing: Definition and methods of decalcification, acid-containing decalcifying fluids, determination of endpoint of decalcification, steps in tissue processin…	5
7	Section cutting: Definition and classification of microtomes, Care and maintenance of microtomes, Microtome knives and sharpening techniques, Automated knife sharpener, D…	10

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Unit	Topic	Hours
8	Routine staining technique: Theories of staining, Definitions: dye, mordents, alum. Classification of haematoxylin, H&E staining and rapid technique, Automated staine…	5
9	Special stains in histopathology- Principle and use of staining procedure o Mucosubstances: PAS, Alcian Blue, Colloidal iron, High iron diamine, Mayer's Mucicarmine o Con…	7
10	Museum Techniques: Specimen mounting steps, fixation of specimens, Museum technique steps	3
	Total	**60**

Unit 1 (5 hours)

CHI 1.1. Introduction to Cytology: Definition of cytology, organisation of cytology laboratory, Types of cytology, Cytological sampling techniques, Sample acceptance and rejection criteria, fixation, reception, processing, and mounting of cytological specimens, Quality control in cytology [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (10 hours)

CHI 2.1. Exfoliative Cytology: Cervical cytology, Fluid cytology-Urinary tract, Respiratory system, CSF, Body fluids [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CHI 2.2. Sex chromatin demonstration and karyotyping, Vital staining for sex chromatin, Aspiration cytology, Cytology staining techniques- PAP, MGG, Shorr's stain, Aceto-orcein stain [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (5 hours)

CHI 3.1. Automation in Cytology: Liquid-based cytology: principles and preparation, Molecular cytology, Cell block technique [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 4 (6 hours)

CHI 4.1. Introduction to histopathology laboratory: Definition of biopsy and autopsy, Types of tissues received, Storage and documentation, Steps in tissue preparation, Grossing procedures, Handling tiny tissue specimens, Quality assurance [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (4 hours)

CHI 5.1. Fixatives: Definition and classification, Qualities of ideal fixatives, Common fixatives used, Methods of fixation, Methods for removing excess fixative [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (5 hours)

CHI 6.1. Tissue processing: Definition and methods of decalcification, acid-containing decalcifying fluids, determination of endpoint of decalcification, steps in tissue processing - Dehydration, clearing, impregnation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CHI 6.2. Embedding moulds and media, Automated tissue processor: parts and working [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (10 hours)

CHI 7.1. Section cutting: Definition and classification of microtomes, Care and maintenance of microtomes, Microtome knives and sharpening techniques, Automated knife sharpener, Disposable blades, Requirements and process of section cutting, Adhesives preparation, Causes and remedies for improper sections, Frozen section-Importance, Technique, Freezing microtome and cryostat [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 8 (5 hours)

CHI 8.1. Routine staining technique: Theories of staining, Definitions: dye, mordents, alum [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CHI 8.2. Classification of haematoxylin, H&E staining and rapid technique, Automated stainer, Mounting media: classification, preparation, purpose [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CHI 8.3. Immunohistochemistry- Tissue preparation and staining, detection of artefacts and remedies [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 9 (7 hours)

CHI 9.1. Special stains in histopathology- Principle and use of staining procedure o Mucosubstances: PAS, Alcian Blue, Colloidal iron, High iron diamine, Mayer's Mucicarmine o Connective tissue: Vangieson, Masson's Trichrome o Reticulin fibres: Gomori's silver, Gordon and Sweets o Elastic fibres: Verhoff's stain o Pigments and minerals: Pearls Prussian blue o Microorganisms: AFB stain o Amyloid: Congo red o Lipids and fats: Oil Red O o Metachromatic staining: Toluidine blue (frozen section [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 10 (3 hours)

CHI 10.1. Museum Techniques: Specimen mounting steps, fixation of specimens, Museum technique steps [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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81. BMLS-603 - Clinical Biochemistry

Course code	BMLS-603	**Course title**	Clinical Biochemistry
Hours	Lecture 4 | Tutorial 0 | Practical 0 | Total contact hours 60	**Credits**	4
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO1, PO2, PO6, PO7
Primary competency alignment	PC5, PC6, PC7, PC9, PC10	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This theory component shares Course Code BMLS-603 with its corresponding practical course, Clinical Biochemistry Practical. Combined course credit for BMLS-603 is 6 (Theory 4 + Practical 2).

Subject Description

Develops understanding of good clinical laboratory practice across the pre-analytical, analytical and post-analytical phases and of organ function tests, including the laboratory diagnosis of diabetes mellitus and liver, renal, gastric, thyroid and cardiac function testing and the biochemistry of cancer.

Course rationale (NCAHP): Students will understand organ function tests, disorders related to abnormalities, and lab techniques used to diagnose disorders

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CB-CO1	Explain the principles and clinical significance of biochemical tests used to assess organ function and disorders of metabolism.	KH	L2 Understand	PO1, PO2, PO6, PO7 PC5, PC6, PC7, PC9, PC10
CB-CO2	Perform routine and specialised biochemical analyses on clinical specimens.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC5, PC6, PC7, PC9, PC10

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CB-CO3	Demonstrate knowledge of automation, instrumentation, and data management in clinical biochemistry.	SH	L3 Apply	PO1, PO2, PO6, PO7 PC5, PC6, PC7, PC9, PC10
CB-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO1, PO2, PO6, PO7 PC5, PC6, PC7, PC9, PC10
CB-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO1, PO2, PO6, PO7 PC5, PC6, PC7, PC9, PC10

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

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Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	GCLP: laboratory safety and Universal precaution, Introduction to Phases in Laboratory, Preanalytical - Specimen collection, processing and handling in clinical laborator…	3
2	Analytical Phase: SOP, Laboratory equipment- maintenance, lab reagents and kits, calibrators, concept of accuracy, precision, reliability, reproducibility, Quality contro…	3
3	Post Analytical Phase: Report generation, Types of error in post analytical, storage and retention of sample, Documentation of report	3
4	Laboratory diagnosis of Diabetes mellitus – Plasma glucose (Fasting, Random, Post Prandial, OGTT, glycosylated haemoglobin. Screening test for inborn errors of metabolism…	8
5	Liver Function Test: Indications and classification of LFT, Test based on bile pigment metabolism, classification of jaundice, Test- based serum enzymes	6
6	Renal Function Test: Indications and classification of RFT. Test based on glomerular filtration, renal plasma flow, and tubular functions. Acid-base balance, including bl…	6
7	Gastric Function Test: Indication and classification of GFT, Examination of resting content. Pancreatic Function Test: Indication of Pancreas function test- Lipases and A…	6
8	Thyroid Function Test: Indications and classification of thyroid function test, tests based on primary function, and blood levels of thyroid hormones	4
9	Cardiac Function Test: Indications of Cardiac function test, Cardiac markers, lipid profile, Enzyme pattern in AMI	5
10	Biochemistry of cancer: Properties of cancer cells, morphological and biochemical changes in cancer cells, carcinogenesis, carcinogens, diagnosis of cancer – oncogenic ma…	4
11	Integration, revision, tutorial, structured problem-solving and formative assessment mapped to the course outcomes of this course (RGUHS reconciliation of the prescribed …	12

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Unit	Topic	Hours
	Total	**60**

Unit 1 (3 hours)

CB 1.1. GCLP: laboratory safety and Universal precaution, Introduction to Phases in Laboratory, Preanalytical - Specimen collection, processing and handling in clinical laboratory, Sample acceptance and rejection criteria, Sources of error [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (3 hours)

CB 2.1. Analytical Phase: SOP, Laboratory equipment- maintenance, lab reagents and kits, calibrators, concept of accuracy, precision, reliability, reproducibility, Quality control (IQC and EQA), Basic statistics (Mean, Median, SD, CV), Westgard rule, LJ graph, Types of error in analytical phase [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (3 hours)

CB 3.1. Post Analytical Phase: Report generation, Types of error in post analytical, storage and retention of sample, Documentation of report [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (8 hours)

CB 4.1. Laboratory diagnosis of Diabetes mellitus – Plasma glucose (Fasting, Random, Post Prandial, OGTT, glycosylated haemoglobin [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CB 4.2. Screening test for inborn errors of metabolism- PKU, Alkaptonuria, Fructosuria, galactosemia, hypercholesterolemia [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Unit 5 (6 hours)

CB 5.1. Liver Function Test: Indications and classification of LFT, Test based on bile pigment metabolism, classification of jaundice, Test- based serum enzymes [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (6 hours)

CB 6.1. Renal Function Test: Indications and classification of RFT. Test based on glomerular filtration, renal plasma flow, and tubular functions [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CB 6.2. Acid-base balance, including blood gas analysis [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (6 hours)

CB 7.1. Gastric Function Test: Indication and classification of GFT, Examination of resting content [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

CB 7.2. Pancreatic Function Test: Indication of Pancreas function test-Lipases and Amylases [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 8 (4 hours)

CB 8.1. Thyroid Function Test: Indications and classification of thyroid function test, tests based on primary function, and blood levels of thyroid hormones [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 9 (5 hours)

CB 9.1. Cardiac Function Test: Indications of Cardiac function test, Cardiac markers, lipid profile, Enzyme pattern in AMI [Competency: K/KH | Revised

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Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 10 (4 hours)

CB 10.1. Biochemistry of cancer: Properties of cancer cells, morphological and biochemical changes in cancer cells, carcinogenesis, carcinogens, diagnosis of cancer – oncogenic markers (AFP, PFA, CEA, bHCG, Myeloma -Bence Jones protein, M band) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 11 (12 hours)

CB 11.1. Integration, revision, tutorial, structured problem-solving and formative assessment mapped to the course outcomes of this course (RGUHS reconciliation of the prescribed contact hours) [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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BMLS-604 - Biostatistics and Research Methodology

Course code	BMLS-604	**Course title**	Biostatistics and Research Methodology
Hours	Lecture 2 | Tutorial 0 | Practical 0 | Total contact hours 30	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO6, PO7, PO9, PO10
Primary competency alignment	PC16, PC17, PC12	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

Subject Description

Develops understanding of descriptive and inferential statistics, sampling, study designs, data collection and presentation, tests of significance, research ethics and scientific writing relevant to laboratory research.

Course rationale (NCAHP): Students will understand statistical concepts and research methods applicable to laboratory sciences and be able to analyse and interpret data in clinical research.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BRM-CO1	Understand basic concepts of biostatistics, including types of data, measures of central tendency, and variability.	KH	L2 Understand	PO6, PO7, PO9, PO10 PC16, PC17, PC12
BRM-CO2	Demonstrate knowledge of sampling techniques, study designs and data collection methods.	SH	L3 Apply	PO6, PO7, PO9, PO10 PC16, PC17, PC12
BRM-CO3	Apply appropriate statistical methods to analyse and interpret health and biomedical data.	KH/SH	L4 Analyze	PO6, PO7, PO9, PO10 PC16, PC17, PC12

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
BRM-CO4	Correlate the content of this course with laboratory investigations, reporting and clinical decision-making.	KH	L4 Analyze	PO6, PO7, PO9, PO10 PC16, PC17, PC12
BRM-CO5	Apply relevant safety, quality-assurance, ethical and documentation requirements to the practice of this subject.	KH	L3 Apply	PO6, PO7, PO9, PO10 PC16, PC17, PC12

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Interactive lecture
- Tutorial and problem-based discussion
- Small-group discussion and seminar
- Demonstration using specimens, slides, models and digital resources
- Flipped classroom and self-directed learning
- Case-based and laboratory-data interpretation exercise
- Guided individual or group assignment linked to specified course outcomes, with faculty feedback and opportunity for improvement.

Assessment Methods

- MCQ
- Structured long essay and short essay
- Short-answer and reasoning questions
- Spotters and data-interpretation exercise
- Viva voce
- Sessional (internal) examination
- Graded assignment, seminar or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may

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select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Unit distribution and hours

Unit	Topic	Hours
1	Introduction to biostatistics: Concepts, types, significance and scope of statistics, meaning of data, sample and parameter, Types and levels of data and their measuremen…	3
2	Descriptive statistics: Measures of dispersion- Range, Inter-quartile range, Variance, Standard deviation and Coefficient of variation	6
3	Introduction to probability and normal distribution. Normal distribution - characteristics of normal distribution	3
4	Sampling methods: Need for sampling and the advantages of sampling over complete enumeration, Sampling and non-sampling error, Probability and nonprobability sampling met…	3
5	Measures of relationship: Correlation – need and meaning, Rank order correlation, Scatter plot, Simple linear regression and prediction	4
6	Testing of significance: Hypothesis, Non-Parametric test- Chi-square, t-test, ANOVA, Mann-Whitney U test. Use of statistical software for data analysis	6
7	Introduction to research methodology: Research methodology, research design and review of literature, Different methods of data collection and data sources	5
	Total	**30**

Unit 1 (3 hours)

BRM 1.1. Introduction to biostatistics: Concepts, types, significance and scope of statistics, meaning of data, sample and parameter, Types and levels of data and their measurement, Organisation and presentation of data-tabulation of data, Frequency distribution, Graphical and tabular presentation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 2 (6 hours)

BRM 2.1. Descriptive statistics: Measures of dispersion- Range, Inter-quartile range, Variance, Standard deviation and Coefficient of variation [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive

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lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 3 (3 hours)

BRM 3.1. Introduction to probability and normal distribution. Normal distribution - characteristics of normal distribution [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 4 (3 hours)

BRM 4.1. Sampling methods: Need for sampling and the advantages of sampling over complete enumeration, Sampling and non-sampling error, Probability and nonprobability sampling methods [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 5 (4 hours)

BRM 5.1. Measures of relationship: Correlation – need and meaning, Rank order correlation, Scatter plot, Simple linear regression and prediction [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 6 (6 hours)

BRM 6.1. Testing of significance: Hypothesis, Non-Parametric test- Chi-square, t-test, ANOVA, Mann-Whitney U test. Use of statistical software for data analysis [Competency: KH | Revised Bloom: L3 (Apply) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

Unit 7 (5 hours)

BRM 7.1. Introduction to research methodology: Research methodology, research design and review of literature, Different methods of data collection and data sources [Competency: K/KH | Revised Bloom: L1-L2 (Remember-Understand) | Suggested TLM: interactive lecture; slide, specimen or data-based demonstration; guided assignment or concept mapping]

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Suggested Readings

1. S.P. Gupta – Statistical Methods, Sultan Chand & Sons
2. B.K. Mahajan – Methods in Biostatistics for Medical Students, Jaypee Brothers Medical Publishers
3. Himanshu Tyagi – RPG Biostatistics, CBS Publishers & Distributors
4. World Health Organisation (2001) – Health Research Methodology: A Guide for Training in Research Methods, WHO Press

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BMLS-602 - Cytology and Histopathology Practical

Course code	BMLS-602	**Course title**	Cytology and Histopathology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC2, PC3, PC5, PC8, PC10	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-602 with its corresponding theory course, Cytology and Histopathology. Combined course credit for BMLS-602 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in grossing assistance, tissue processing, embedding, microtomy, H&E and special staining, frozen-section assistance, cytology smear preparation and Papanicolaou staining, and slide filing and archiving.

Course rationale (NCAHP): Students will gain practical knowledge of techniques used in Cytology and Histopathology laboratories, including specimen collection, preservation, and processing of various cytological samples. They will also learn to perform routine and special staining procedures and identify chromosomal abnormalities 1. Demonstrate receiving, handling, and labelling and specimen rejection criteria of cytological specimen. 2. Fine needle aspiration cytology 3. Preparation of fixatives in cytology laboratory and fixation of cytological specimens 4. Demonstrate cytological specimen preservation. 5. Demonstrate specimen processing in cytology – Gynaecological, Urine, Body fluids, Cerebrospinal fluid (CSF), sputum, - Liquid-based cytology. 6. Preparation for Papanicolaou (Pap) stain 7. Demonstrate staining - May-Grunwald Giemsa (MGG) staining, Myeloperoxidase staining, Sudan black B (SBB), Nonspecific esterase, Per Iodic acid Schiff staining (PAS), Neutrophil alkaline phosphatase (NAP), Gabbet's modified Ziehl Neelsen staining. 8. Quality control in a cytology

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laboratory 9. Demonstrate the preparation of fixatives- 10% Neutral buffered formalin, Formal Saline. 10. Demonstrate preparation of decalcifying fluid - Gooding & Stewart's fluid 11. Perform the tissue processing – fixation, dehydration, clearing, impregnation 12. Demonstrate the procedure for knife sharpening - Honing & stropping 13. Perform section cutting of tissue block using a microtome 14. Haematoxylin and Eosin staining 15. Perform mounting of the stained section 16. Demonstrate staining for carbohydrates, lipids, amyloid collagen, reticulin, elastic fibres, pigments, and Acid-Fast Bacillus (AFB). 17. Demonstrate immunohistochemistry techniques, Enzyme histochemistry- diagnostic applications and the demonstration of phosphates, dehydrogenases, oxidases and peroxidases *Clinical laboratory rotation/observation can be incorporated wherever possible

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CHIP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the cytology and histopathology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC8, PC10
CHIP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC8, PC10
CHIP-CO3	Perform the prescribed procedures in cytology and histopathology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC8, PC10
CHIP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC2, PC3, PC5, PC8, PC10
CHIP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC2, PC3, PC5, PC8, PC10

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CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CHIP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC2, PC3, PC5, PC8, PC10

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

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Prescribed practical exercises

CHIP 1. Demonstrate receiving, handling, and labelling and specimen rejection criteria of cytological specimen. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 2. Fine needle aspiration cytology [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 3. Preparation of fixatives in cytology laboratory and fixation of cytological specimens [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 4. Demonstrate cytological specimen preservation. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 5. Demonstrate specimen processing in cytology – Gynaecological, Urine, Body fluids, Cerebrospinal fluid (CSF), sputum, - Liquid-based cytology. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 6. Preparation for Papanicolaou (Pap) stain [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 7. Demonstrate staining - May-Grunwald Giemsa (MGG) staining, Myeloperoxidase staining, Sudan black B (SBB), Nonspecific esterase, Per Iodic acid Schiff staining (PAS), Neutrophil alkaline phosphatase (NAP), Gabbet's modified Ziehl Neelsen staining. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 8. Quality control in a cytology laboratory [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 9. Demonstrate the preparation of fixatives- 10% Neutral buffered formalin, Formal Saline. [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 10. Demonstrate preparation of decalcifying fluid - Gooding & Stewart's fluid [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM:

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demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 11. Perform the tissue processing – fixation, dehydration, clearing, impregnation [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 12. Demonstrate the procedure for knife sharpening - Honing & stropping [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 13. Perform section cutting of tissue block using a microtome [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 14. Haematoxylin and Eosin staining [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 15. Perform mounting of the stained section [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 16. Demonstrate staining for carbohydrates, lipids, amyloid collagen, reticulin, elastic fibres, pigments, and Acid-Fast Bacillus (AFB). [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CHIP 17. Demonstrate immunohistochemistry techniques, Enzyme histochemistry- diagnostic applications and the demonstration of phosphates, dehydrogenases, oxidases and peroxidases [Competency: SH/P | Revised Bloom: L3-L4 (Apply-Analyze) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. Bancroft, J. D., & Gamble, M. (Eds.). (2008). Theory and practice of histological techniques. Elsevier health sciences.
2. Koss, L. G., & Melamed, M. R. (Eds.). (2006). Koss' diagnostic cytology and its histopathologic bases (Vol. 1). Lippincott Williams & Wilkins.

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3. Ramakrishnan, S., & Sulochana, K. N. (Eds.). (2012). Manual of Medical laboratory techniques. Jaypee Brothers Medical Publishers Pvt. Ltd.
4. Lynch, M. J., & Raphael, S. S. . Lynch's Medical laboratory technology.
5. Baker, F. J., & Silverton, R. E. (2014). Introduction to medical laboratory technology. Butterworth-Heinemann.
6. Koss, L.G. and Melamed, M.R. eds., 2006. Koss' diagnostic cytology and its histopathologic bases (Vol. 1). Lippincott Williams & Wilkins.
7. Nayak, R., & Nayak, R. (2023). Review of Postgraduate Pathology (Systemic Pathology): Two Volume Set. JP Medical Ltd.
8. Carson, F. L., & Cappellano, C. H. (2009). Histotechnology: A self-instructional text (3rd ed.). ASCP Press.
9. Curran, R. C., & Crocker, J. (2000). Curran's atlas of histopathology. (No Title).
10. Sadhana Vishwakarma (2017). Edition : 1/e. Techniques in Histopathology and Cytopathology.
11. Cibas, E. S., & Ducatman, B. S. (2003). Cytology: Diagnostic principles and clinical correlates. Gulf Professional Publishing.

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BMLS-603 - Clinical Biochemistry Practical

Course code	BMLS-603	**Course title**	Clinical Biochemistry Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC4, PC5, PC6, PC7, PC9	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-603 with its corresponding theory course, Clinical Biochemistry. Combined course credit for BMLS-603 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner in organ-function test profiles on automated and semi-automated analysers, quality-control charting, calibration verification and the interpretation and reporting of clinical biochemistry results.

Course rationale (NCAHP): Students will be able to understand and critically diagnose various organ function tests and enzyme markers. 1. Construction of the Levey-Jennings (LJ) graph and interpretation of Westgard rule 2. Oral Glucose Tolerance Test (OGTT) Estimation of following profile test using the kit method 3. Lipid profile a. Triglycerides b. Cholesterol c. HDL 4. Renal Function Test a. Urea b. Uric acid c. Creatinine 5. Liver function test a. Total Protein b. Albumin c. Total Bilirubin d. Direct bilirubin e. SGOT f. SGPT g. Alkaline Phosphatase h. Urinary Bile salt, Bile pigment, urobilinogen 6. Electrolytes a. Sodium b. Potassium c. Chloride Demonstration of the following 7. Glycosylated Hemoglobin (HbA1C) 8. Thyroid Function Test a. T3 b. T4 c. TSH *Clinical laboratory rotation/observation can be incorporated wherever possible

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Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
CBP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the clinical biochemistry laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC4, PC5, PC6, PC7, PC9
CBP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC4, PC5, PC6, PC7, PC9
CBP-CO3	Perform the prescribed procedures in clinical biochemistry accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC4, PC5, PC6, PC7, PC9
CBP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC4, PC5, PC6, PC7, PC9
CBP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC4, PC5, PC6, PC7, PC9
CBP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC4, PC5, PC6, PC7, PC9

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study
- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

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Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

CBP 1. Construction of the Levey-Jennings (LJ) graph and interpretation of Westgard rule [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CBP 2. Oral Glucose Tolerance Test (OGTT) Estimation of following profile test using the kit method [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CBP 3. Lipid profile a. Triglycerides b. Cholesterol c. HDL [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CBP 4. Renal Function Test a. Urea b. Uric acid c. Creatinine [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CBP 5. Liver function test a. Total Protein b. Albumin c. Total Bilirubin d. Direct bilirubin e. SGOT f. SGPT g. Alkaline Phosphatase h. Urinary Bile salt, Bile pigment, urobilinogen [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CBP 6. Electrolytes a. Sodium b. Potassium c. Chloride Demonstration of the following [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM:

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demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CBP 7. Glycosylated Hemoglobin (HbA1C) [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

CBP 8. Thyroid Function Test a. T3 b. T4 c. TSH [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. U. Sathyanarayana – Biochemistry, Elsevier
2. Robert K. Murray et al. – Harper's Illustrated Biochemistry, Tata McGraw-Hill
3. M.N. Chatterjee & Rana Shinde – Textbook of Medical Biochemistry, Jaypee
4. Alan Gowenlock – Varley's Practical Clinical Biochemistry, CBS
5. Nader Rifai et al, Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, Saunders / Elsevier

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BMLS-601 - Applied Pathobiology Practical

Course code	BMLS-601	**Course title**	Applied Pathobiology Practical
Hours	Lecture 0 | Tutorial 0 | Practical 4 | Total contact hours 60	**Credits**	2
Examination status	University examination subject: continuous (internal) assessment 30; end-semester University examination 70; total 100.	**Primary PO alignment**	PO2, PO6, PO7
Primary competency alignment	PC5, PC9, PC16, PC17	**Level legend**	K = Knows; KH = Knows How; S = Shows; SH = Shows How; P = Performs independently

This practical component shares Course Code BMLS-601 with its corresponding theory course, Applied Pathobiology. Combined course credit for BMLS-601 is 6 (Theory 4 + Practical 2).

Subject Description

Trains the learner to correlate gross and microscopic pathology with laboratory findings through slide and specimen study, case-based interpretation and structured reporting.

Course rationale (NCAHP): The course will bridge the diagnostic foundation of disease mechanisms including anatomy, physiology, and microbiology. The course emphasizes the integration of clinical knowledge with laboratory practice, enabling students to understand how cellular and tissue changes reflect disease processes. 1. Basic interpretation of histopathological slides (normal vs diseased tissue) 2. Microscopic Identification of Cellular Changes: (i) Hypertrophy, (ii) atrophy (iii) dystrophy 3. Microscopic pattern recognition in (i) inflammation, (ii) neoplasia, (iii) necrosis 4. Identification of pathological features in gross specimens: (i) liver, (ii) lung, (iii) kidney, (iv) heart, and any other organs 5. Correlation with clinical symptoms and microscopic imaging of disease- case based studies 6. Reporting practice in histopathology and cytology (minimum 15-20 different case studies can be incorporated). *** If the Institutes are having limitations with biological samples educational slides are readily available which can help them to learn the basic needs of

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the practical. The remaining hours can be compensated by clinical lab rotations.

Course Outcomes

CO code	On successful completion, the learner will be able to:	Competency level	Revised Bloom level	Primary PO / competency alignment
APP-CO1	Apply biosafety, standard precautions and biomedical waste rules while working in the applied pathobiology laboratory.	SH/P	L3 Apply	PO2, PO6, PO7 PC5, PC9, PC16, PC17
APP-CO2	Prepare, verify and use the reagents, stains, media, controls and equipment required for the prescribed procedures.	SH	L3 Apply	PO2, PO6, PO7 PC5, PC9, PC16, PC17
APP-CO3	Perform the prescribed procedures in applied pathobiology accurately, safely and reproducibly as per standard operating procedures.	SH/P	L3 Apply	PO2, PO6, PO7 PC5, PC9, PC16, PC17
APP-CO4	Record observations, calculate results and identify sources of pre-analytical, analytical and post-analytical error.	SH/P	L4 Analyze	PO2, PO6, PO7 PC5, PC9, PC16, PC17
APP-CO5	Interpret results against reference intervals and correlate them with the relevant clinical conditions.	SH/P	L4 Analyze	PO2, PO6, PO7 PC5, PC9, PC16, PC17
APP-CO6	Document and report findings in the prescribed laboratory format and maintain the practical record and logbook.	SH/P	L3 Apply	PO2, PO6, PO7 PC5, PC9, PC16, PC17

Mapping shown is primary and developmental, not exhaustive. Earlier semesters introduce foundations; independent laboratory performance is expected only after progressive teaching, supervised laboratory training and internship.

Teaching-Learning Methods

- Demonstration and DOAP (Demonstrate - Observe - Assist - Perform)
- Supervised bench practice with structured checklists
- Skill station and return demonstration
- Microscopy, slide and specimen study

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- Quality-control exercise and error analysis
- Laboratory record maintenance and result interpretation exercise
- Guided practical assignment or logbook task mapped to specified course outcomes, with faculty feedback.

Assessment Methods

- Objective Structured Practical Examination (OSPE)
- Practical performance with structured rubric
- Spotters and identification stations
- Laboratory record/journal evaluation
- Viva voce
- Sessional (internal) practical examination
- Logbook, quality-control exercise or case task mapped to specified course outcomes.

Course Contents

The bracketed notation after each subunit indicates the specified developmental competency-performance level, the dominant Revised Bloom cognitive level and illustrative teaching-learning methods. The methods are not exclusive; teachers may select equivalent methods suited to learner needs, available resources and the approved course outcomes.

Prescribed practical exercises

APP 1. Basic interpretation of histopathological slides (normal vs diseased tissue) [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

APP 2. Microscopic Identification of Cellular Changes: (i) Hypertrophy, (ii) atrophy (iii) dystrophy [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

APP 3. Microscopic pattern recognition in (i) inflammation, (ii) neoplasia, (iii) necrosis [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

APP 4. Identification of pathological features in gross specimens: (i) liver, (ii) lung, (iii) kidney, (iv) heart, and any other organs [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

APP 5. Correlation with clinical symptoms and microscopic imaging of disease- case based studies [Competency: SH | Revised Bloom: L3 (Apply) |

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Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

APP 6. Reporting practice in histopathology and cytology (minimum 15-20 different case studies can be incorporated). [Competency: SH | Revised Bloom: L3 (Apply) | Suggested TLM: demonstration and DOAP; supervised bench practice; return demonstration and structured checklist]

Clinical laboratory rotation and structured observation shall be incorporated wherever possible. Every learner shall maintain a certified practical record and shall perform each prescribed exercise under supervision.

Suggested Readings

1. Mohan, H. (2015). Textbook of pathology. Jaypee Brothers Medical Publishers.
2. Kumar, V., Abbas, A. and Aster, J. (2020) Robbins and Cotran Pathologic Basis of Diseases. 10th Edition, Elsevier
3. MOHAN, Harsh. (2013). Pathology Practical Book. New Delhi: Jaypee Brothers Medical.
4. Klatt, E. C. (2014). Robbins and Cotran atlas of pathology. Elsevier Health Sciences.
5. Godkar, P. B., & Godkar, D. P. (2006). Textbook of medical laboratory technology. Bhalani publishing house. SEMESTER VII & VIII

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Third Year Mapping Annexure 1 - Course-to-Programme-Outcome Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
BMLS-501 Mycology and Parasitology	✓	✓				✓	✓				✓		
BMLS-502 Analytical Biochemistry	✓	✓				✓	✓		✓		✓		✓
BMLS-503 Immunohaematology and Transfusion Medicine	✓	✓		✓	✓	✓					✓		✓
BMLS-504 Medical Law and Ethics				✓	✓					✓			
BMLS-501 Mycology and Parasitology Practical		✓				✓	✓				✓		
BMLS-502 Analytical Biochemistry Practical		✓				✓	✓		✓		✓		✓
BMLS-503 Immunohaematology and Transfusion Medicine Practical		✓		✓	✓	✓					✓		✓
BMLS-601 Applied Pathobiology	✓	✓				✓	✓				✓		
BMLS-602 Cytology and Histopathology	✓	✓				✓	✓				✓	✓	
BMLS-603 Clinical Biochemistry	✓	✓				✓	✓				✓	✓	✓
BMLS-604 Biostatistics and Research Methodology						✓	✓		✓	✓			
BMLS-602 Cytology and Histopathology Practical		✓				✓	✓				✓	✓	
BMLS-603 Clinical Biochemistry Practical		✓				✓	✓				✓		✓
BMLS-601 Applied Pathobiology Practical		✓				✓	✓				✓		

A tick indicates the primary developmental contribution of the course to that outcome. It does not restrict the universal applicability of PO1-PO10 and PSO1-PSO3 across the programme.

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Third Year Mapping Annexure 2 - Professional-Competency Contribution

Course	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9	PC 10	PC 11	PC 12	PC 13	PC 14	PC 15	PC 16	PC 17	PC 18
BMLS-501 Mycology and Parasitology		✓			✓				✓		✓					✓		
BMLS-502 Analytical Biochemistry				✓	✓	✓	✓									✓		
BMLS-503 Immunohaematology and Transfusion Medicine	✓				✓		✓		✓				✓	✓				
BMLS-504 Medical Law and Ethics												✓	✓	✓	✓			
BMLS-501 Mycology and Parasitology Practical		✓	✓		✓				✓		✓							
BMLS-502 Analytical Biochemistry Practical				✓	✓	✓	✓											
BMLS-503 Immunohaematology and Transfusion Medicine Practical	✓				✓		✓		✓				✓					
BMLS-601 Applied Pathobiology					✓				✓							✓	✓	
BMLS-602 Cytology and Histopathology		✓			✓			✓	✓	✓								
BMLS-603 Clinical Biochemistry					✓	✓	✓		✓	✓								
BMLS-604 Biostatistics and Research Methodology												✓				✓	✓	
BMLS-602 Cytology and Histopathology Practical		✓	✓		✓			✓		✓								
BMLS-603 Clinical Biochemistry Practical				✓	✓	✓	✓		✓									
BMLS-601 Applied Pathobiology Practical					✓				✓							✓	✓	

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Part IV - Internship (Semesters VII and VIII)

Twelve months of progressively responsible supervised laboratory practice across all major diagnostic disciplines, together with a research component, portfolio completion, case and method presentations and readiness for entry-level independent practice.

Internship Course Structure

Course	Semester	Clinical-laboratory hours	Credits	Continuous assessment	End-semester assessment	Total marks	Assessment status
BMLS-701 Internship - Laboratory posting / research dissertation	VII	900	20	90	210	300	Institutional continuous assessment with University-prescribed end-semester logbook and viva
BMLS-801 Internship - Laboratory posting / research dissertation	VIII	900	20	90	210	300	Institutional continuous assessment with University-prescribed end-semester logbook and viva
Total		**1800**	**40**	**180**	**420**	**600**	

Minimum engagement: 12 calendar months, 52 weeks, 42 hours per week, ordinarily 7 hours per day for 6 days per week, amounting to not less than 1800 hours. Where the learner opts for a research dissertation, it shall be of a minimum duration of six months.

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Eligibility and Commencement

- The candidate shall have successfully completed the entire coursework of Semesters I to VI, that is 100% of the prescribed credits, including all theory, practical and NUES courses.
- Before commencement, the institution shall report the candidate details as prescribed and the candidate shall obtain provisional registration from KSAHC or the competent State regulatory authority.
- The designation during training shall be Medical Laboratory Science Intern / BMLS Intern.
- Completion of Basic Life Support orientation and documented biosafety and immunisation status, including hepatitis B immunisation, is mandatory before posting.
- During the internship the intern shall adhere to the rules and regulations of the host organisation and of the parent institution.

Internship Course Outcomes

Outcome	On successful completion, the intern will be able to:	Competency level	Revised Bloom level	Professional competency alignment
INT-CO1	Collect, receive, identify and manage clinical specimens safely, applying standard precautions and correct pre-analytical practice.	P	L3 Apply	PC1, PC2, PC11
INT-CO2	Prepare, verify and use reagents, stains, media, calibrators and controls required for routine and specialised investigations.	P	L3 Apply	PC3, PC7
INT-CO3	Operate, calibrate, verify and maintain manual, semi-automated and automated analysers and resolve routine technical problems.	P	L4 Analyze	PC4, PC6
INT-CO4	Perform the prescribed range of investigations in pathology, haematology, clinical pathology, transfusion medicine, clinical biochemistry and microbiology.	P	L3-L4 Apply-Analyze	PC5, PC9
INT-CO5	Perform internal quality control, interpret quality-control data and participate in external quality assessment.	P	L4-L5 Analyze-Evaluate	PC7, PC8

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Outcome	On successful completion, the intern will be able to:	Competency level	Revised Bloom level	Professional competency alignment
INT-CO6	Recognise abnormal and critical results, apply delta checks and reference intervals, and correlate laboratory data with clinical conditions.	P	L4 Analyze	PC9, PC10
INT-CO7	Generate, verify and release accurate reports within turnaround time and notify critical values promptly and correctly.	P	L3-L4 Apply-Analyze	PC10, PC12
INT-CO8	Apply biosafety, infection-control and biomedical waste management requirements consistently in every posting.	P	L3 Apply	PC11
INT-CO9	Use the laboratory information system for accession, data entry, retrieval, back-up and reporting while protecting data privacy.	P	L3 Apply	PC12
INT-CO10	Communicate effectively and ethically with clinicians, patients, donors, peers and supervisors, and document communication accurately.	P	L3-L5 Apply-Evaluate	PC13, PC14, PC15
INT-CO11	Demonstrate professional behaviour, accountability, confidentiality, patient safety and responsible use of equipment and consumables.	P	L3-L5 Apply-Evaluate	PC14, PC18
INT-CO12	Search, appraise and apply scientific evidence relevant to method selection, verification and laboratory decision-making.	P	L4-L5 Analyze-Evaluate	PC16, PC17
INT-CO13	Complete and defend a supervised research dissertation or laboratory project demonstrating ethical inquiry and scholarly communication.	SH/P	L5-L6 Evaluate-Create	PC16, PC17
INT-CO14	Demonstrate readiness for entry-level independent medical laboratory practice, mentorship, resource management and lifelong professional development.	P	L5 Evaluate	PC1-PC18

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Department-Wise Rotatory Posting and Learning Alignment

Department / area	Duration	Expected performance focus	Programme outcomes / professional competencies	Revised Bloom coverage	Suggested TLM / evidence
Histopathology and Cytopathology	2 months	Grossing assistance, tissue processing, embedding, microtomy, routine and special staining, cryostat and frozen sections, FNAC assistance, cytology smear preparation and screening, slide archiving	PO1-PO10; PC2, PC3, PC5, PC8, PC10	L1-L6 integrated; dominant L3-L5	Supervised bench practice; slide review sessions; case discussion; portfolio
Haematology and Clinical Pathology	2 months	Phlebotomy, automated cell counting, peripheral smear reading, special haematology, coagulation testing, urinalysis and body-fluid analysis	PO1-PO10; PC1, PC5, PC7, PC9, PC10	L1-L6 integrated; dominant L3-L5	Supervised bench practice; smear and morphology review; QC exercise; case presentation
Transfusion Medicine / Blood Centre	2 months	Donor selection and counselling, blood collection, component preparation and storage, grouping, antibody screening, compatibility testing, TTI screening, haemovigilance and documentation	PO1-PO10; PC1, PC5, PC7, PC9, PC13, PC14	L1-L6 integrated; dominant L3-L5	Supervised donor and bench practice; SOP-based training; adverse-event review; logbook

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Department / area	Duration	Expected performance focus	Programme outcomes / professional competencies	Revised Bloom coverage	Suggested TLM / evidence
Clinical Biochemistry	2 months	Sample acceptance and processing, automated and semi-automated analysis, calibration, internal quality control and Levey-Jennings interpretation, organ-function profiles, critical values	PO1-PO10; PC4, PC5, PC6, PC7, PC9	L1-L6 integrated; dominant L3-L5	Supervised analyser operation; QC and troubleshooting exercise; result-validation practice
Microbiology, Serology and Molecular Diagnostics	2 months	Specimen processing, culture and identification, antimicrobial susceptibility testing, media and strain QC, serological assays, nucleic acid extraction and amplification, biosafety practice	PO1-PO10; PC2, PC3, PC5, PC7, PC11	L1-L6 integrated; dominant L3-L5	Supervised bench practice; plate reading rounds; biosafety audit; case-based discussion
Research posting - individual or group project or dissertation	2 months	Literature review, topic formulation, protocol and ethics submission, data collection and analysis, manuscript or dissertation drafting and presentation	PO6-PO10; PC16, PC17, PC18	L4-L6	Mentored research; journal club; protocol review; dissertation seminar and viva

The sequence may be arranged by RGUHS or the affiliated institution according to approved facilities, but the prescribed duration, breadth, supervision and minimum hours shall be maintained. Postings shall be documented with competency acquisition against the prescribed checklist.

Laboratory Teaching-Learning Methods during Internship

- Supervised bench practice with progressive entrustment from observation to independent performance.
- Bench-side teaching, morning rounds, slide and plate review sessions and inter-professional discussion.
- Demonstration, DOAP, return demonstration and deliberate practice for high-risk or unfamiliar procedures.
- Case presentation, method presentation, peer review, journal club and quality-improvement discussion.
- Guided assignments, reflective writing, logbook review and structured formative feedback.
- Simulation for needle-stick injury, spill management, transfusion reaction, critical-value notification and patient-safety events.
- Mentored research activity, protocol development, data analysis and scientific writing.

Required Documentation and Portfolio

Component	Minimum requirement	Competency / Bloom	Suggested learning and verification
Daily logbook	Dated entries of procedures performed, specimens handled, instruments operated and learning points, with supervisor validation.	P; L3-L5	Weekly sign-off and feedback
Weekly goals	Rotation-specific targets set by the intern and reviewed by the supervisor.	P; L3-L5	Supervisor review and reflective note
Competency checklist	Per-rotation skill validation for every prescribed procedure, including staining, cryostat handling, component preparation, analyser operation and AST.	SH/P; L3-L4	Direct observation and structured checklist
Quality-control record	Documented participation in internal QC and in at least one external quality assessment cycle, with interpretation and corrective action.	P; L4-L5	QC chart review and audit

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Component	Minimum requirement	Competency / Bloom	Suggested learning and verification
Case and method presentations	At least twelve presentations across the rotations, including abnormal-result correlation and method or instrument presentations.	P; L4-L5	Presentation, questioning and rubric
Supervisor feedback	Five-point rating on independence, safety, accuracy, documentation and professional behaviour for each rotation.	P; L4-L5	Rotation rubric and feedback interview
Research dissertation or project	Approved topic, ethics clearance where applicable, protocol, data analysis, written report, presentation and viva.	SH/P; L5-L6	Protocol review, mentoring, report and viva
Biosafety and immunisation record	Documented immunisation status, biosafety training and incident/exposure reporting where applicable.	P; L3	Institutional record verification

Formative Assessment, Grading and Certification

There shall be no University theory or practical examination for the internship. The internship shall be assessed continuously and reported as prescribed by RGUHS. Formative assessment shall include Objective Structured Practical Examination (OSPE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedural Skills (DOPS), reflective portfolios, supervisor evaluations, peer-reviewed research logs and recorded demonstrations.

RGUHS harmonized rubric for each internship semester (300 marks): continuous assessment 90 marks and end-semester logbook and viva 210 marks, distributed as follows.

Domain	Marks	Minimum evidence
Attendance, punctuality and professional conduct	30	Verified attendance of not less than 90%, discipline, ethics, communication and responsibility.
Rotation performance and competency checklist	60	Rotation rubrics, direct observation, skill validation and supervisor ratings.
Logbook, records and documentation	60	Daily logbook, weekly goals, QC records, report validation and reflective entries.

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Domain	Marks	Minimum evidence
Case and method presentations	60	Prescribed number of presentations with rubric-based evaluation.
Research dissertation or project, presentation and viva	90	Approved project, ethical and data-integrity compliance, written report, presentation and viva.
Total for each internship semester	**300**	Satisfactory completion of every required rotation and mandatory activity.

- Attendance of not less than 90% is required, and a maximum of 12 days of leave is permitted during the internship, apart from the weekly off. Excess absence shall be compensated in the same posting for the corresponding duration.
- Unsatisfactory performance may require repetition or extension for the period determined by the competent institutional authority under the approved RGUHS framework.
- The internship centre shall have adequate laboratory infrastructure, case load and qualified registered medical laboratory professionals. The supervisor to intern ratio shall not exceed 1:10.
- Where a posting occurs outside the parent institution, the parent institution shall coordinate the internship, monitor learning and maintain records. Prior approval of RGUHS and KSAHC shall be obtained as prescribed; retrospective approval shall not be assumed.
- The internship completion certificate shall specify departments, dates, duration and total hours, details of the research component, and shall be authenticated by the HOD or Coordinator and the Head of the Institution.
- Following satisfactory completion and institutional reporting, RGUHS shall record 1800 hours and 40 credits in the transcript and declare eligibility for the award of the BMLS degree. Professional registration remains with KSAHC or the competent regulatory authority.

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Internship Annexure 1 - Rotation Performance Record

Rotation	Dates / days	Procedures performed	Quality-control participation	Presentations	Competency level	Supervisor rating / signature
Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry
Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry
Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry

Internship Annexure 2 - Competency Assessment Rubric

Assessment domain	PO alignment	PC alignment	Minimum evidence required in each rotation	Rating
Specimen management and pre-analytical practice	PO1, PO2, PO4	PC1, PC2, PC11	Observed collection, labelling, acceptance and rejection decisions with documentation	1-4
Reagent, media and instrument readiness	PO2, PO7	PC3, PC4	Reagent preparation records, calibration and maintenance logs	1-4
Analytical performance	PO1, PO2, PO6	PC5, PC6	Observed procedures with accuracy, precision and turnaround compliance	1-4
Quality control and quality management	PO2, PO6, PO10	PC7, PC8	QC charts, corrective action records, audit or EQAS participation	1-4
Result interpretation and reporting	PO1, PO2, PO5	PC9, PC10, PC12	Validated reports, critical-value notification records, delta-check decisions	1-4
Biosafety, infection control and waste management	PO2, PO4	PC11	Observed practice, spill or exposure drill, BMW segregation audit	1-4
Communication, teamwork and referral	PO3, PO5	PC13, PC15	Clinician and donor interaction, handover, team participation	1-4

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Assessment domain	PO alignment	PC alignment	Minimum evidence required in each rotation	Rating
Ethics, confidentiality and medico-legal compliance	PO4, PO10	PC14	Consent, confidentiality, medico-legal specimen handling and documentation	1-4
Evidence-based practice and research	PO6, PO7	PC16, PC17	Literature search and appraisal, method verification, project progress	1-4
Leadership, resource management and development	PO8, PO10	PC18	Inventory and workflow contribution, mentoring of juniors, CPD record	1-4

Rating scale and completion expectation: 1 = requires direct and continuous supervision; 2 = performs with frequent prompting; 3 = performs with indirect supervision or occasional prompting; 4 = performs independently and consistently within lawful scope. The target by completion of the internship is Level 4 (P). The RGUHS Board of Studies may prescribe the rotation pass rule, the remediation process and the aggregation method.

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Internship Annexure 3 - Mandatory Portfolio Completion Checklist

- All six prescribed rotations completed with dates and supervisor certification.
- Minimum 1800 hours and 40 credits documented across Semesters VII and VIII.
- Daily logbook, weekly goals and competency checklists completed and validated.
- Quality-control records and evidence of participation in at least one EQAS cycle attached.
- At least twelve case and method presentations completed and rated.
- Research dissertation or project report, presentation and viva completed.
- Biosafety training, immunisation record and incident reports, where applicable, attached.
- Attendance of not less than 90%, professional conduct and patient-safety requirements satisfactory.
- All remediation or extension requirements, if any, completed.
- Completion certificate signed by the HOD or Coordinator and the Head of the Institution.

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Consolidated Programme Annexures

These templates and implementation directions apply to the entire BMLS programme and are therefore stated once rather than repeated after every semester.

Consolidated Annexure A - Institutional Assessment Mapping Template

Semester	Assessment item / station	Content unit	CO(s)	PO(s) / PC(s)	Competency / Bloom	Marks	Rubric / key
Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry	K/KH/S/SH/P; L1-L6	Institutional entry	Attach / reference
Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry	K/KH/S/SH/P; L1-L6	Institutional entry	Attach / reference
Institutional entry	Institutional entry	Institutional entry	Institutional entry	Institutional entry	K/KH/S/SH/P; L1-L6	Institutional entry	Attach / reference

Consolidated Annexure B - Programme Attainment and Progression Record

Phase	PO / PC reviewed	Direct evidence	Indirect evidence	Attainment level	Corrective / improvement action	University review
First Year (Semesters I and II)	Institutional entry	Course, practical and sessional assessment	Learner and faculty feedback	Institutional entry	Institutional entry	Institutional entry
Second Year (Semesters III and IV)	Institutional entry	Course, practical and sessional assessment	Learner and faculty feedback	Institutional entry	Institutional entry	Institutional entry

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Phase	PO / PC reviewed	Direct evidence	Indirect evidence	Attainment level	Corrective / improvement action	University review
Third Year (Semesters V and VI)	Institutional entry	Course, practical, project and sessional assessment	Learner and faculty feedback	Institutional entry	Institutional entry	Institutional entry
Internship (Semesters VII and VIII)	Institutional entry	Rotation rubrics, portfolio, presentations and dissertation	Learner and faculty feedback	Institutional entry	Institutional entry	Institutional entry

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Consolidated Annexure C - University Implementation Directions

1. This consolidated curriculum and syllabus shall apply to students admitted to the Bachelor of Medical Laboratory Science programme from the Academic Year 2026-27. Students admitted earlier shall continue under the curriculum applicable at the time of their admission, unless otherwise notified by RGUHS.
2. The complete programme comprises 4125 hours, 160 credits and 4800 assessment marks, and shall be implemented in accordance with the applicable RGUHS regulations and the KSAHC framework.
3. The semester-wise schemes shall be implemented as follows: Semester I - 375 hours, 20 credits and 700 marks; Semesters II to VI - 390 hours, 20 credits and 700 marks each; and the internship in Semesters VII and VIII - 1800 hours, 40 credits and 600 marks.
4. The programme outcomes, programme-specific outcomes, professional competencies, course outcomes and course and content-level competency, Revised Bloom and teaching-learning mappings contained in this document constitute the approved implementation framework.
5. The RGUHS course-specific requirements incorporated in the respective courses form part of the approved curriculum. They shall be accommodated within the prescribed hours and credits without displacing the NCAHP-prescribed core content.
6. Internal assessment, NUES, OSPE, practical examinations, project and dissertation work, portfolio, workplace-based assessment and internship assessment shall be implemented in accordance with this curriculum and the applicable University regulations.
7. Question-paper blueprints, paper duration, question distribution, valuation and result processing shall comply with the applicable University ordinances, examination regulations and directions issued by RGUHS.
8. Institutions shall maintain the minimum standard requirements for laboratories, equipment, lab ware, library, computing facility and teaching faculty prescribed by NCAHP and KSAHC for Medical Laboratory Sciences.
9. Internship eligibility, rotation distribution, approved centres, attendance, leave, extension, completion and certification shall be governed by the provisions contained in this curriculum and the applicable University and regulatory requirements.
10. The Department of Curriculum Development may issue standardized course-delivery, mapping, assessment, attainment, portfolio and reporting

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formats. Affiliated institutions shall maintain and submit the prescribed records as directed by RGUHS.

Acknowledgement

CURRICULUM COMMITTEE: ALLIED HEALTH SCIENCES MEMBERS LIST

1. Prof. Rajesh Shenoy - Council Representative, KAHPA
2. Dr. Sai Kumar - UG & PG Dean, Faculty of Allied Health Sciences & Physiotherapy
3. Dr. Shruthi H P - PG BOS Chairman, Faculty of Allied Health Sciences.
4. Dr. Nethra S S - UG BOS Chairman, Faculty of Allied Health Sciences.
5. Mr. Rahul E - Associate Professor, Kempegowda Institute of Allied Health Sciences, Bangalore
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12. Ms. Moumita - Associate Professor, Narayana Hrudayalaya Institute of Allied Health Sciences, Bangalore
13. Ms. Mahitha K C- Medical Physicist & RSO, Bangalore Medical College & Research Institute, Bangalore

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