REVA UNIVERSITY
Bengaluru, India

(School of Allied Health Sciences)
B. Sc. Medical Laboratory Technology
HAND BOOK
2021

Rukmini Knowledge Park
Kattigenahalli, Yelahanka, Bengaluru – 560064
Phone No: +91-080-46966966, Fax: 080-28478539
www.reva.edu.in

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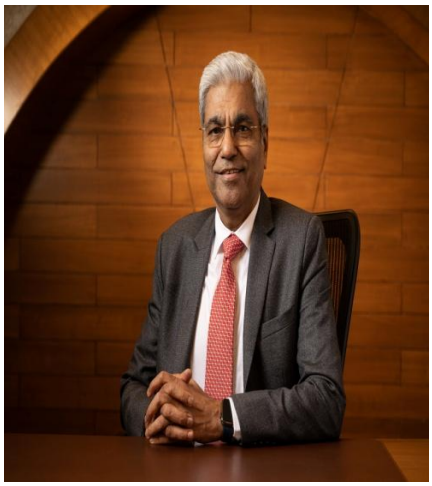
Chancellor's Message

"Education is the most powerful weapon which you can use to change the world."

- Nelson Mandela.



There was a time when survival depended on just the realization of physiological needs. We are indeed privileged to exist in a time when 'intellectual gratification' has become indispensable. Information is easily attainable for the soul that is curious enough to go look for it. Technological boons enable information availability anywhere anytime. The difference, however, lies between those who look for information and those who look for knowledge.

It is deemed virtuous to serve seekers of knowledge and as educators it is in the ethos at REVA University to empower every learner who chooses to enter our portals. Driven by our founding philosophy of 'Knowledge is Power', we believe in building a community of perpetual learners by enabling them to look beyond their abilities and achieve what they assumed impossible.

India has always been beheld as a brewing pot of unbelievable talent, acute intellect and immense potential. All it takes to turn those qualities into power is a spark of opportunity. Being at a University is an exciting and rewarding experience with opportunities to nurture abilities, challenge cognizance and gain competence.

For any University, the structure of excellence lies in the transitional abilities of its faculty and its facility. I'm always in awe of the efforts that our academic board puts in to develop the team of subject matter experts at REVA. My faculty colleagues understand our core vision of empowering our future generation to be ethically, morally and intellectually elite. They practice the art of teaching with a student- centered and transformational approach. The excellent infrastructure at the University, both educationaland extra-curricular, magnificently demonstrates the importance of ambience in facilitating focused learning for our students.

A famous British politician and author from the 19th century - Benjamin Disraeli, once said 'A University should be a place of light, of liberty and of learning'. Centuries later this dictum still inspires me and I believe, it takes team-work to build successful institutions. I welcome you to REVA University to join hands in laying the foundation of your future with values, wisdom and knowledge.

Dr. P. Shyama Raju
The Founder and Hon'ble Chancellor, REVA University

Vice-Chancellor's Message

The last two decades have seen a remarkable growth in higher education in India and across the globe. The move towards inter-disciplinary studies and interactive learning have opened up several options as well as created multiple challenges. India is at a juncture where a huge population of young crowd is opting for higher education. With the tremendous growth of privatization of education in India, the major focus is on creating a platform for quality in knowledge enhancement and bridging the gap between academia and industry.

A strong believer and practitioner of the dictum "Knowledge is Power", REVA University has been on the path of delivering quality education by developing the young human resources on the foundation of ethical and moral values, while boosting their leadership qualities, research culture and innovative skills. Built on a sprawling 45 acres of green campus, this 'temple of learning' has excellent and state-of-the-art infrastructure facilities conducive to higher teaching-learning environment and research. The main objective of the University is to provide higher education of global standards and hence, all the programs are designed to meet international standards. Highly experienced and qualified faculty members, continuously engaged in the maintenance and enhancement of student-centric learning environment through innovative pedagogy, form the backbone of the University.

All the programs offered by REVA University follow the Choice Based Credit System (CBCS) with Outcome Based Approach. The flexibility in the curriculum has been designed with industry-specific goals in mind and the educator enjoys complete freedom to appropriate the syllabus by incorporating the latest knowledge and stimulating the creative minds of the students. Bench marked with the course of studies of various institutions of repute, our curriculum is extremely contemporary and is a culmination of efforts of great think-tanks - a large number of faculty members, experts from industries and research level organizations. The evaluation mechanism employs continuous assessment with grade point averages. We believe sincerely that it will meet the aspirations of all stakeholders – students, parents and the employers of the graduates and postgraduates of REVA University.

At REVA University, research, consultancy and innovation are regarded as our pillars of success. Most of the faculty members of the University are involved in research by attracting funded projects from various research level organizations like DST, VGST, DBT, DRDO, AICTE and industries. The outcome of the

research is passed on to students through live projects from industries. The entrepreneurial zeal of the students is encouraged and nurtured through EDPs and EACs.

REVA University has entered into collaboration with many prominent industries to bridge the gap between industry and University. Regular visits to industries and mandatory internship with industries have helped our students. REVA University has entered into collaboration with many prominent industries to bridge the gap between industry and University. Regular visits to industries and mandatory internship with industries have helped our students become skilled with relevant to industry requirements. Structured training programs on soft-skills and preparatory training for competitive exams are offered here to make students more employable. 100% placement of eligible students speaks the effectiveness of these programs. The entrepreneurship development activities and establishment of "Technology IncubationCenters" in the University extend full support to the budding entrepreneurs to nurture their ideas and establish an enterprise.

With firm faith in the saying, "Intelligence plus character –that is the goal of education" (Martin Luther King, Jr.), I strongly believe REVA University is marching ahead in the right direction, providing a holistic education to the future generation and playing a positive role in nation building. We reiterate our endeavor to provide premium quality education accessible to all and an environment for the growth of over-all personality development leading to generating "GLOBAL PROFESSIONALS".

Welcome to the portals of REVA University!

Dr. M Dhanamjaya
Vice-Chancellor, REVA University

MESSAGE FROM THE DIRECTOR

Medical Laboratory Technology (MLT) is Allied Health Sciences program assimilates in itself a number of disciplines and as such hasgrown rapidly. B Sc in MLT offered by REVA University aims to provide the required skills and knowledge necessary to pursue a successful career in MLT. This program imparts need based, practical education in contemporary world to develop global competence among students. It strives to prepare students to become leaders in the field of Health Sciences in general and MLT in particular by encouraging them to inculcate scientific thinking coupled with creative and innovative ideas.

The program provides hands- on training and practical skills in the field of Health Sciences like Pathology, Microbiology & Biochemistry in the Medical field.

As far as employment is concerned MLT has become one of the fast-growing sectors. Employment record shows that MLT has a great scope in future. Medical laboratory technician can find careers with Hospitals, and allied health care.

The curriculum caters to and has relevance to local, regional, national, global developmental needs. Maximum number of courses are integrated with cross cutting issues with relevant to professional ethics, gender, human values, environment and sustainability.

This handbook provides you outline of regulations for bachelor's degree, scheme of instruction, and detailed syllabus. I am sure the students choosing BSc Medical Laboratory Technology at REVA University will enjoythe curriculum, teaching and learning environment, the vast infrastructure and the experienced teacher's involvement and guidance. We will strive to provide all needed comfort and congenial environment for their studies. I wish all students a pleasant stay at REVA and grand success in theircareer.

Dr. Jayashree S
Director
School of Allied Health Sciences

PREFACE

Higher education across the globe is opening doors of its academic disciplines to the real-world experiences. The disciplinary legitimacy is under critical review. Trans-border mobility and practice learning are being fore-grounded as guiding principles. Interactive learning, bridging disciplines and facilitating learners to gain different competencies through judicious management of time is viewed as one of the greatest and fascinating priorities and challenges today.

Indian economy is experiencing an upward growth right from the beginning of 21st century necessitating well qualified science graduates to work as scientists, teachers, algorithm developers, computer programmers, professionals and often administrators. At present more than 400 million youth are below 18 years of age and government is committed to increase the GER to 30% by 2020, further necessitating more number of teachers and professors to work in schools and colleges. Research has also been given equal importance. Pivate sector and Corporates are also looking for smart science graduaes in a big way. TheB.Sc. (MLT) degree program of REVA University is designed to prepare lab technician, biochemists, microbiologist, scientists, teachers, professionals & administrators who are motivated, enthuastics & creative thinkers to meet the challenges of growing economy as well as to fulfill the growing aspirations of the youth.

The program has been developed with an emphasis on knowledge assimilation, application, national and international job market and its social relevance. The outcome based curriculum designed and followed imbibes required theoretical concepts and practical skills in the domain. By undergoing this program, you will develop critical, analytical thinking and problem solving abilities for a smooth transition from academic to real-life work environment. The L: T: P structure of teaching and learning under Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) would certainly help our students learn and build competencies needed in this knowledge based society.

This handy document containing brief information about B.Sc. (MLT) program, scheme of instruction and detailed course content will serve as a guiding path to you to move forward in a right direction.

I am sure you will enjoythe curriculum, teaching and learning environment, the vast infrastructure and the experienced teachers involvement and guidance. We will strive to provide all needed comfort andcongenial environment for your studies. I wish you and allstudents' pleasant stay in REVA and grand success in your career.

CONTENTS

RUKMINI EDUCATIONAL CHARITABLE TRUST

It was the dream of late Smt. Rukmini Shyama Raju to impart education to millions of underprivileged children as she knew the importance of education in the contemporary society. The dream of Smt. Rukmini Shyama Raju came true with the establishment of Rukmini Educational Charitable Trust (RECT), in the year 2002. **Rukmini Educational Charitable Trust** (RECT) is a Public Charitable Trust, set up in 2002 with the objective of promoting, establishing and conducting academic activities in the fields of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology, among others. In furtherance of these objectives, the Trust has set up the REVA Group of Educational Institutions comprising of REVA Institute of Technology & Management (RITM), REVA Institute of Science and Management (RISM), REVA Institute of Management Studies (RIMS), REVA Institute ofEducation (RIE), REVA First Grade College (RFGC), REVA Independent PU College at Kattigenahalli, Ganganagar and Sanjaynagar and now REVA University. Through these institutions, the Trust seeks to fulfill its vision of providing world class education and create abundant opportunities for the youth of this nation to excel in the areas of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology.

Every great human enterprise is powered by the vision of one or more extraordinary individuals and is sustained by the people who derive their motivation from the founders. The Chairman of the Trust is Dr. P. Shyama Raju, a developer and builder of repute, a captain of the industry in his own right and the Chairman and Managing Director of the DivyaSree Group of companies. The idea of creating these top notched educational institutions was born of the philanthropic instincts of Dr. P. Shyama Raju to do public good, quite in keeping with his support to other socially relevant charities such as maintaining the Richmond road park, building and donating a police station, gifting assets to organizations providing accident and trauma care, to name a few.

The Rukmini Educational Charitable Trust drives with the main aim to help students who are in pursuit of quality education for life. REVA is today a family of ten institutions providing education from PU to Post Graduation and Research leading to PhD degrees. REVA has well qualified experienced teaching faculty of whom majority are doctorates. The faculty is supported by

committed administrative and technical staff. Over 13,000 students study various courses across REVA's three campuses equipped with exemplary state-of-the-art infrastructure and conducive environment for the knowledge driven community.

REVA University has been established under the REVA University Act, 2012 of Government of Karnataka and notified in Karnataka State Gazette dated 7thFebruary, 2013. The University is empowered by UGC to award degrees any branch of knowledge under Sec.22 of the UGC Act. The University is a Member of Association of Indian Universities, New Delhi. The main objective of the University is to prepare students with knowledge, wisdom and patriotism to face the global challenges and become the top leaders of the country and the globe in different fields.

REVA University located in between Kempegowda International Airport and Bangalore city, has a sprawling green campus spread over 45 acres of land and equipped with state-of-the-art infrastructure that provide conducive environment for higher learning and research. The REVA campus has well equipped laboratories, custom-built teaching facilities, fully air-conditionedlibrary and central computer centre, the well planned sports facility with cricket ground, running track & variety of indoor and outdoor sports activities, facilities for cultural programs. The uniquefeature of REVA campus is the largest residential facility for students, faculty members and supportive staff.

The University is presently offering 23 Post Graduate Degree programs, 20 Degree and PG Degree programs in various branches of studies and has 15000+ students studying in various branches of knowledge at graduate and post graduate level and 410 Scholars pursuing research leading to PhD in 18 disciplines. It has 800+ well qualified, experienced and committed faculty members of whom majority are doctorates in their respective areas and most of them are guiding students pursuing research leading to PhD.

The programs being offered by the REVA University are well planned and designed after detailed study with emphasis with knowledge assimilation, applications, global job market and their social relevance. Highly qualified, experienced faculty and scholars from reputed universities / institutions, experts from industries and business sectors have contributed in preparing the scheme of instruction and detailed curricula for this program. Greater emphasis on

practice in respective areas and skill development to suit to respective job environment has been given while designing the curricula. The Choice Based Credit System and Continuous Assessment Graded Pattern (CBCS – CAGP) of education has been introduced in all programs to facilitate students to opt for subjects of their choice in addition to the core subjects of the study and prepare them with needed skills. The system also allows students to move forward under the fast track for those who have the capabilities to surpass others. These programs are taught by wellexperienced qualified faculty supported by the experts from industries, business sectors and such other organizations. REVA University has also initiated many supportive measures such as bridgecourses, special coaching, remedial classes, etc., for slow learners so as to give them the needed input and build in them confidence and courage to move forward and accomplish success in their career. The University has also entered into MOUs with many industries, business firms and otherinstitutions seeking their help in imparting quality education through practice, internship and also assisting students' placements.

REVA University recognizing the fact that research, development and innovation are the important functions of any university has established an independent Research and Innovation division headed by a senior professor as Dean of Research and Innovation. This division facilitates all faculty members and research scholars to undertake innovative research projects in engineering, science & technology and other areas of study. The interdisciplinary- multidisciplinary research is given the top most priority. The division continuously liaisons between various funding agencies, R&D Institutions, Industries and faculty members of REVA University to facilitate undertaking innovative projects. It encourages student research projects by forming different research groups under the guidance of senior faculty members. Some of the coreareas of research wherein our young faculty members are working include Data Mining, Cloud Computing, Image Processing, Network Security, VLSI and Embedded Systems, Wireless Censor Networks, Computer Networks, IOT, MEMS, Nano- Electronics, Wireless Communications, Bio- fuels, Nano-technology for coatings, Composites, Vibration Energies, Electric Vehicles, Multilevel Inverter Application, Battery Management System, LED Lightings, Renewable Energy Sources and Active Filter, Innovative Concrete Reinforcement, Electro Chemical Synthesis, Energy Conversion Devices, Nano-structural Materials, Photo-electrochemical Hydrogen generation, Pesticide Residue Analysis, Nano materials, Photonics, Nano Tribology, Fuel Mechanics, Operation Research, Graph theory, Strategic Leadership and Innovative

Entrepreneurship, Functional Development Management, Resource Management and Sustainable Development, Cyber Security, General Studies, Feminism, Computer Assisted Language Teaching, Culture Studies etc.

The REVA University has also given utmost importance to develop the much required skills through variety of training programs, industrial practice, case studies and such other activities that induce the said skills among all students. A full-fledged Career Development and Placement (CDC) department with world class infrastructure, headed by a dynamic experienced Professor & Director, and supported by well experienced Trainers, Counselors and Placement Officers. The University also has University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director facilitating skill related training to REVA students and other unemployed students. The University has been recognized as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana. The Centre conducts several add-on courses in challenging areas of development. Itis always active in facilitating student's variety of Skill Development Training programs.

The University has collaborations with Industries, universities abroad, research institutions, corporate training organizations, and Government agencies such as Florida International University, Okalahoma State University, Western Connecticut University, University of Alabama,Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC^2, VMware, SAP, Apollo etc, to facilitate student exchange and teacher–scholar exchange programs andconduct training programs. These collaborations with foreignuniversities also facilitates students to study some of the programs partly in REVA University and partly in foreign university, viz,
M.S in Computer Science one year in REVA University and the next year in the University of Alabama, Huntsville, USA.

The University has also given greater importance to quality in education, research, administration and all activities of the university. Therefore, it has established an independent Internal Quality division headed by a senior professor as Director of Internal Quality. The division works on planning, designing and developing different quality tools, implementing them and monitoring the implementation of these quality tools. It concentrates on training entire faculty to adopt the new tools and implement their use. The division further works on introducing various examination and administrative reforms.

To motivate the youth and transform them to become innovative entrepreneurs, successful leaders of tomorrow and committed citizens of the country, REVA organizes interaction between students and successful industrialists, entrepreneurs, scientists and such others from time to time. As a part of this exercise great personalities such as Bharat Ratna Prof. C. N. R. Rao, a renowned Scientist, Dr. N R Narayana Murthy, Founder and Chairman and Mentor of Infosys, Dr. K Kasturirangan, Former Chairman ISRO, Member of Planning Commission, Government of India, Dr. Balaram, Former Director I.I.Sc., and noted Scientist, Dr. V S Ramamurthy, Former Secretary, DST, Government of India, Dr. V K Aatre, noted Scientist and former head of the DRDO and Scientific Advisor to the Ministry of Defence Dr. Sathish Reddy, Scientific Advisor, Ministry of Defence, New Delhi and many others have accepted our invitation and blessed our students and faculty members by their inspiring addresses and interaction.

As a part of our effort in motivating and inspiring youth of today, REVA University also has instituted awards and prizes to recognize the services of teachers, researchers, scientists, entrepreneurs, social workers and such others who have contributed richly for the development of the society and progress of the country. One of such award instituted by REVA University is **'Life Time Achievement Award'** to be awarded to successful personalities who have made mark in their field of work. This award is presented on occasion of the **"Founders' Day Celebration"** of REVA University on 6th January of every year in presence of dignitaries, faculty members and students gathering. The first "REVA Life Time Achievement Award" for the year 2015 has been awarded to Shri. Kiran Kumar, Chairman ISRO, followed by Shri. Shekhar Gupta, renowned Journalist for the year 2016, Dr K J Yesudas, renowned play back singer for the year 2017. REVAalso introduced "**REVA Award of Excellence"** in the year 2017 and the first Awardee of this prestigious award is Shri Ramesh Aravind, Actor, Producer, Director, Screen Writer and Speaker.

REVA organizes various cultural programs to promote culture, tradition, ethical and moral values to our students. During such cultural events the students are given opportunities to unfold their hidden talents and motivate them to contribute innovative ideas for the progress of the society. One of such cultural events is REVAMP conducted every year. The event not only gives opportunities to students of REVA but also students of other Universities and Colleges. During three days of this mega event students participate in debates, Quizzes, Group discussion, Seminars, exhibitions and variety of cultural events. Another important event is Shubha Vidaaya,

- Graduation Day for the final year students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take their future career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and wonmedals and prizes in academic, cultural and sports activities are also recognized by distributing awards and prizes. The founders have also instituted medals and prizes for sports achievers every year. The physical education department conducts regular yoga classes every day to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

Recognizing the fast growth of the university and its quality in imparting higher education, the BERG (Business Excellence and Research Group), Singapore has awarded BERG Education Award 2015 to REVA University under Private Universities category. The University has also been honored with many more such honors and recognitions.

Vision

REVA University aspires to become an innovative university by developing excellent human resources with leadership qualities, ethical and moral values, research culture and innovative skills through higher education of global standards

Mission

- To create excellent infrastructure facilities and state-of-the-art laboratories and incubation centers
- To provide student-centric learning environment through innovative pedagogy and education reforms
- To encourage research and entrepreneurship through collaborations and extension activities
- To promote industry-institute partnerships and share knowledge for innovation and development
- To organize society development programs for knowledge enhancement in thrust areas
- To enhance leadership qualities among the youth and enrich personality traits, promote patriotism and moral values.

Objectives

- Creation, preservation and dissemination of knowledge and attainment of excellence in different disciplines
- Smooth transition from teacher - centric focus to learner - centric processes and activities
- Performing all the functions of interest to its major constituents like faculty, staff, students and the society to reach leadership position
- Developing a sense of ethics in the University and Community, making it conscious of its obligations to the society and the nation
- Accepting the challenges of globalization to offer high quality education and other services in a competitive manner

ABOUT SCHOOL OF ALLIED HEALTH SCIENCES

The School of Allied Health Sciences offers graduate and post graduate programs in Biochemistry, Medical Laboratory Technician, Medical Radiology and Diagnostic Imaging, Nutrition and Dietetics which are incredibly fascinating. It aims to attract talented youth and train them to acquire knowledge and skills useful to industrial sectors, research laboratories, and educational institutions. The School also facilitates research leading to PhD in Biochemistry, Microbiology and related areas of study.

The School of Allied Health Sciences is shouldered by well qualified, experienced and highly committed faculty. The state-of-the-art infrastructure digital classrooms, well equipped laboratories, conference rooms and the serene academic atmosphere at REVA University will enhance the transfer as well as creation of knowledge. The school provides an interactive, collaborative peer tutoring environment that encourages students to break down complex problems and develop strategies for finding solutions across a variety of situations and disciplines. The school aims to develop a learning community of critical thinkers who serves as models of innovative problems solving in the university environment to enrich their academic and professional careers.

Vision

To nurture intellect, creativity, character and professionalism among students and impart contemporary knowledge in various branches of Biological and Allied health Sciences that are socially relevant and transform them to become global citizens.

Mission

To achieve excellence in studies and research through pedagogy and support interface between industry and academia

Values

1. Excellence in all our academic and research endeavours

2. Dedication and service to our stakeholders
3. Leadership through innovation
4. Accountability and transparency
5. Creating conducive academic environment with service motto
6. Integrity and intellectual honesty
7. Ethical and moral behaviour
8. Freedom of thought and expression
9. Adaptability to the change
10. Team-work

"The constant questioning of our values and achievements is a challenge without which neither science nor society can remain healthy"

— Aage Niels Bohr

Advisory Board Members

Sl.No.	Name of the Member	Designation
1	**Dr. Jayashree S** Prof. and HOD School of Biochemistry, REVA University jayashrees@reva.edu.in 8610123372	Chairperson
2	**Dr. Gale Kathleen Edward** HOD Laboratory Service and Consultant Pathologist ELBIT Medical Diagnostics Pvt. Ltd galekathleen@gmail.com 9901994545	External Member
3	**Dr. Sujatha K** Associate Professor of Anatomy, P.E.S. Institute of Medical Sciences and Research, Kuppam, Chittoor district, Andhra Pradesh sujathambbs@gmail.com 9916287074	External Member
4	**Dr. Ramesh Kumar Kushwaha** School of Biochemistry, REVA University rameshkumar.k@reva.edu.in 7905947987	Internal Member
5	**Dr. Sikandar Mulla** School of Biochemistry, REVA University sikandar.mulla@reva.edu.in 7483072566	Internal Member
6	**Prof. Pooja R Karkera** School of Biochemistry, REVA University poojar.karkera@reva.edu.in 9741224361	Internal Member

B. Sc (Medical Laboratory Technology)

Programme Overview

The Bachelor of Science (B.Sc.) in Medical Laboratory Technology is an Allied Health specialty program that deals with the diagnosis, treatment and prevention of diseases through the utilization of clinical laboratory tests. As important members of the health care group, medical laboratory experts play an important role in collecting the information required to provide the best care to an ill or injured patient. The truth of the matter is that the practice of modern medicine would be outlandish without the tests performed in the laboratory. In this programme the students learn to perform diagnostic analysis on body fluids which include hematological, bacteriological, immunologic, biochemical and microscopic tests that aid in the diagnosis and treatment of diseases.

Medical Laboratory Technology is becoming an essential component of a growing array of areas of investigation in medical health management. The medical treatment starts only after the diagnosis of the disease and diagnose, doctors need various kinds of analysis through tests. On the basis of outcome of these tests, consultant treats and gives advice for prevention and cure. This is where the crucial role of Medical Laboratory Technology or Clinical laboratory science comes in picture. The Medical Laboratory Technicians are the ones who does the blood collection and perform the various diagnostic tests by analysing body fluids like blood, saliva and urine, tissues, microorganism screening, chemical analyses, cell counts of human body etc. This work involves the integration of human anatomy and physiology, biochemistry, microbiology, chemistry, medical laboratory techniques, applied immunology, blood coagulation and urinalysis in the broadest sense, and the interplay of these areas with areas of potential application; the Medical Laboratory Technology is best conceived of as including all these components. These activities are crucial to medical diagnosis, human healthcare activities, and healthy nation.

REVA UNIVERSITY has designed to offer B.Sc. in Medical Laboratory Technology degree programme toward human health care diagnostic field such as hematological, bacteriological, immunologic, biochemical and microscopic tests for healthy nation. Medical Laboratory Technicians play an important role in collecting the information needed, sampling, testing, reporting and documentation of these investigations. They determine the presence, extent or

absence of disease and provide data needed to evaluate the effectiveness of treatment. Hence, this programme equips students with the knowledge and skills required to handle advanced lab equipments and perform accurate laboratory tests.

Indian healthcare sector is experiencing rapid change. However, this transformation has been ongoing for several years it has become considerably visible in the last decade, with a renewed emphasis from both the government and a growing market for healthcare services and products. Beginning of 21st century except for a short stint during the mid of present decade demanding well qualified medical lab technician to work with physician, lab manager or medical technologist. At present more than 600 million youth are below 25 years of age and government is committed to increase the GER to 30% by 2020, further necessitatingmore number of medical lab technicians to work in health care management. This B.Sc. Medical Laboratory Technology degree program is designed to prepare qualified medical lab technician to meet the challenges of growing market for healthcare services as well as to meetthe growing aspirations of the youth.

The B.Sc. Medical Laboratory Technology programme has been planned and designed after a detailed study and interactions with various universities, research establishments and industries in India and abroad. The program has been developed with an emphasis on knowledge assimilation, application, national job market and its social relevance. The curriculum is outcome based and it imbibes required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, diagnostic analysis and perform accurate laboratory tests for a smooth transition from medical diagnosis to real-life work environment. In addition, students are trained in communication skills and interdisciplinary topics to enhance their scope. The above mentioned features of the programme, advanced research and development to medical diagnostics, and experience of the faculty members with their strong connections with industry, hospitals and research organizations makes this programme unique.

Programme Educational Objectives (PEOs)

The B.Sc. Medical Laboratory Technology programme acts as a foundation degree and helps to develop critical, diagnostic analysis and perform accurate laboratory tests skills at first level. This foundation degree program makes the graduates employable in a hospital, minor emergency

centers, private laboratory, blood donor centers, healthcare centre or clinics, research facilities, crime laboratories, universities, pharmaceutical companies and military and also to assume laboratory manager/consultant/supervisor or laboratory information system analyst/consultant or hospital outreach coordination in various types of health care organizations and also helps to go forward and pursue higher studies and make career in research and development to medical diagnostics or scientific organization.

The programme educational objectives of the B.Sc (MLT) course is to prepare graduates to

PEO-1	Demonstrate problem solving skills in Performing routine Clinical Laboratory Procedures by communicating effectively either leading a team or as a team member.
PEO-2	Express Express oral and written interpersonal skills as part of the health care team to understand, learn and advance their careers through research developments and seeking higher learning.
PEO-3	Understand the professional, ethical and social responsibilities through lifelong learning skills

Programme Outcomes (POs)

PO1. knowledge in the areas of phlebotomy, clinical chemistry, immunology,pathogenic microbiology and pathology.

PO2. Apply the fundamentals of basic clinical laboratory principles to solve and interpret problems.

PO3. Comprehend, analyze, model and solve complex problems in the areas of diagnostic laboratory test results.

PO4. Recognize the need to expertise in the areas of medical laboratory technology by self-up gradation through life long learning.

PO5. Communicate with clarity and coherence, both written and verbally.

PO6. Exhibit professional and ethical responsibility.

PO7. Encourage collaborative learning through group activities and clinical hands-on learning.

PO8. Use latest computer techniques and tools to carry out scientific investigations and develop new diagnostic solutions and solve problems related to environment and society.

Programme Specific Outcomes (PSOs)

After successful completion of the programme, the graduates shall be able to

PSO1. Demonstrate the various techniques in Biochemistry, Microbiology and Pathology

PSO2. Apply the concepts in designing , development and implementation in clinicallaboratory

PSO3. Comprehend the fundamentals of medical laboratory skills and undertake advanced level of knowledge to analyse and create techniques to solve problems.

REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for Science Graduate Degree Programs, 2021

(Framed as per the provisions under Section 35 (ii), Section 7 (x) and Section 8 (xvi) & (xxi) of the REVA University Act, 2012)

1. Title and Commencement:

1.1. These Regulations shall be called the **"REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for Under Graduate Degree Programs- 2021".**

1.2. These Regulations shall come into force from the date of assent of the Chancellor.

2. The Programs:

The following programs and all Graduate Degree programs to be instituted and introduced in REVA University in coming years shall follow these regulations.

B.Sc in:

Medical Laboratory Technology

Biotechnology, Biochemistry and Genetics

Physics Chemistry and Mathematics

Mathematics, Physics and Statistics

Mathematics Statistics and Computer Science

Bioinformatics, Biology Mathematics & Computer Science

3. Definitions:

Course: Every course offered will have three components associated with the teaching-learning process of the course, namely:

L= Lecture (ii) T= Tutorial (iii) P=Practice; where:

L stands for **Lecture** session consisting of classroom instruction.

T stands for **Tutorial** session consisting participatory discussion / selfstudy/ desk work/ brief seminar presentations by students and such other novel methods that make a student to absorb and assimilate more effectively the contents delivered in the Lecture classes.

P stands for **Practice** session and it consists of Hands on Experience / Laboratory Experiments / Field Studies / Case Studies that equip students to acquire the much required skill component.

4. Courses of study and Credits

4.1. The study of various subjects in B.Sc., degree program are grouped under various courses. Each of these course carries credits which are based on the number of hours of teaching and learning.

4.1.1. In terms of credits, every **one hour session of L amounts to 1 credit per Semester.**
In terms of credits, every **one hour session of L amounts to 1 credit per Semester** and a minimum of **two hour session of T or P amounts to 1 credit per Semester** over a period of one Semester of 16 weeks for teaching-learning process.

4.1.2. The total duration of a semester is 20 weeks inclusive of semester-end examination.

4.1.3. **A course shall have either or all the four components.** That means a course may have only lecture component, or only practical component or combination of any two or all the three components.

4.1.4. The concerned BoS will assign Credit Pattern for every course based on the requirement. However, generally, courses can be assigned with 1-4 Credits depending on the size of the course.

4.1.5. Different **Courses of Study** are labelled and defined as follows:

Core Course:

A course which should compulsorily be studied by a candidate as a core-requirement is termed as a Core course. The CORE courses of Study are of THREE types, viz – (i) Foundation Course (ii) Hard Core Course, and (iiI) Soft Core Course.

Foundation Course (FC)

a. Foundation Courses are four courses including language study which are mandatory in nature prescribed by the University and should be completed successfully as part of Graduate Degree Program irrespective of the branch of study.

b. Hard Core Course (HC):

The **Hard Core Course** is a Core Course in the main branch of study and related branch (es) of study, if any that the candidates have to complete compulsorily.

c. Soft Core Course (SC):

A Core course may be a **Soft Core** if there is a choice or an option for the candidate to choose a course from a pool of courses from the main branch of study or from a sister/related branch of study which supports the main branch of study.

d. Open Elective Course:

An elective course chosen generally from other discipline / subject, with an intention to seek exposure to the basics of subjects other than the main discipline the student is studying is called an O**pen Elective Course.**

e. Clinical Postings /Internship/:

Clinical Postings /Internship is a special course involving application of knowledge in solving / analysing /exploring a real life situation / difficult problem. An internship carrying **EIGHT** credits and Clinical postings with 2 to 4 credits on each semester. **Clinical Postings /Internship may be a hard core or a Soft Core as decided by the BoS / concerned.**

5. Scheme, Duration and Medium of Instructions:

5.1 The Three Year degree program is of 6 semesters (3 years) duration. A candidate can avail a maximum of 12 semesters (6 years) as per double duration norm, in one stretch to complete the ThreeYear Degree, including blank semesters, if any. Whenever a candidate opts fo blank semester, he/she has to study the prevailing courses offered by the School when he/she resumes his/her studies.

6.2. The medium of instruction shall be English.

6. Credits and Credit Distribution

7.1. A candidate has to earn 144 credits for successful completion of Three Year Degree B.Sc MLT with a distribution of credits as given in Table - 1 below:

Table-1

Credits and Credit Distribution for Three Year degree programs

Course Type	Credits for Three Year Degree (6 semesters)
AEC	2
CC (including languages)	11
HC	60
RULO	8
CL	39
Total	**120**

7.2. The concerned BOS based on the credits distribution pattern given above shall prescribe the credits to various types of courses and shall assign title to every course including project work, practical work, and field work, self-study elective, as **Foundation Course (FC), Hard Core (HC) or Open Elective (OE)**.

7.3. Every course including project work, practical work, Clinical Postings, self-study elective should be entitled as Foundation Course (FC), Hard Core (HC) or Soft Core (SC) or Open Elective (OE) by the BoS concerned.

However, following shall be the RULO (REVA Unique Learning Offerings) courses with credits mentioned against them, common to all branches of study. However, the BOS of respective program/ discipline shall decide about the total credits for RULO courses.

RULO Courses		
Sl. No.	Course Title	Number of

		Credits
1	Sports, Yoga, Music, Dance, Theatre	02
2	Internship	04
3	Soft Skill Training	04
4	Skill Development Course	02
	Total	12

7.4. The concerned BOS shall specify the desired Program Objectives, Program Educational Objectives, Program Specific Outcomes and Course Outcomes while preparing the curriculum of a particular program.

7.5. A candidate can enroll for a maximum of 27 credits and a minimum of 21 credits per Semester. However, he / she may not successfully earn a maximum of 27 credits per semester. This maximum of 27 credits does not include the credits of courses carried forward by a candidate.

7.6. Only such full time candidates who register for a minimum prescribed number of credits in each semester from I semester to VI semester and complete successfully 144 credits in 6 successive semesters shall be considered for declaration of Ranks, Medals, Prizes and are eligible to apply for Student Fellowship, Scholarship, Free ships, and such other rewards / advantages which could be applicable for all full time students and for hostel facilities.

7. Add-on Proficiency Certification / Diploma:

7.1 Add- on Proficiency Certification:

To acquire Add on Proficiency Certification a candidate can opt to complete a minimum of 2 extra credits either in the same discipline /subject or in different discipline / subject in excess to 144 credits for the Three Year Graduate degree programs.

7.2 Add on Proficiency Diploma:

To acquire Add on Proficiency Diploma, a candidate can opt to complete a minimum of 2 extra credits either in the same discipline /subject or in different discipline / subject in excess to 144 credits for the Three Year Graduate degree programs.

The Add on Proficiency Certification / Diploma so issued to the candidate contains the courses studied and grades earned.

8. Assessment and Evaluation

a) Each course is assessed for a total weight of 100%. Out of the total 100% weight; 50% weight is for Continuous Internal Assessment (CIA or IA) and the remaining 50% for the Semester End Examination (SEE). This is applicable for theory, laboratory, workshop, studio and any such courses

b) Out of 50% weight earmarked for Internal Assessment (IA)- 15% for test-1, 15% for test-2 and 20% for Assignments and this is applicable for theory based courses

c) The tests and assignments are conducted as per the semester academic calendar provided by the University.

The details as given in the table

Component	**Description**	**Conduction**	**Weight Percentage**
C1	**Test-1: IA1**	**6th week from the starting date of semester**	**15**
	Test-2: IA2	**12th week from the starting date of semester**	**15**
C2	**1 Assignment 1**	**7th week**	**10**
	2 Assignment 2	**13th week**	**10**
C3	**SEE including practical & Clinical Postings Report**	**between 17th Week-20th Week**	**50**
Results to be Announced			**By the end of 21st Week**

Note: IA or CIA includes C1 and C2

Each test must be conducted for a duration of 60 minutes, setting the test question paper for a maximum of 30 marks. The final examination must be conducted for a duration of 3 hours and the question paper must be set for a maximum of 100 marks.

d) Students are required to complete courses like technical skills, placement related courses, Open electives and any such value addition or specialized courses through online platforms like SWAYAM/NPTEL/Any other reputed online education aggregator. Students are required tochoose the courses on the advice of their course coordinator/Director and required to submit the

course completion certificate along with percentage of marks/grade scored in the assessment conducted by the online education aggregator. If the online education aggregator has issued a certificate along with the grade or marks scored to students, such courses will be considered for SGPA calculations, in case the aggregator has issued only a certificate and not marks scored, then such courses will be graded through an examination by concerned School, in case, if grading is not possible, students will be given a pass grade and award the credit and the credits will not be considered for SGPA calculations. The Online/MOOCs courses will not have continuous internal assessment component

Such of those students who would like to discontinue with the open elective course that they have already registered for earning required credits can do so, however, they need to complete the required credits by choosing an alternative open elective course.

Setting question paper and evaluation of answer scripts.

i. For SEE, three sets of question papers shall be set for each theory course out of which two sets will be by the internal examiners and one set will be by an external examiner. In subsequent years by carrying forward the unused question papers, an overall three sets of question papers should be managed and depending on the consumption of question papers either internal or external examiner be called for setting the question paper to maintain an overall tally of 3 papers with the conditioned mentioned earlier. The internal examiner who sets the question paper should have been course tutor

ii. The Chairman of BoE shall get the question papers set by internal and external examiners.

iii. The Board of Examiners shall scrutinize and approve the question papers and scheme of valuation. It is the responsibility of the BoE to see that all questions contained in the question paper are within the prescribed syllabus of the concerned course.

iv. There shall be single valuation for all theory papers by internal examiners. However, there shall be moderation by the external examiner who has the subject background. In case no external examiner with subject background is available, a senior faculty member within the discipline shall be appointed as moderator.

v. The SEE examination for Practical work / Field work / Project work/Internship will be conducted jointly by internal and external examiners as detailed below: However, the BoE on its discretion can also permit two internal examiners.

vi. If a course is fully of (L=0):T:(P=0) type or a course is partly P type i.e, (L=3):

(T=0) (P=1), then the examination for SEE component will be as decided by the BoS concerned.

9. Evaluation of Practical's and Minor Project / Major Project / Dissertation /Clinical Postings

10.3.1. A practical examination shall be assessed on the basis of:

a) Knowledge of relevant processes;

b) Skills and operations involved;

c) Results / products including calculation and reporting.

10.3.2. In case a course is fully of P type (L=0:T=0:P=4), the performance of a candidate shall be assessed for a maximum of 100 marks as explained below:

a) Continuous Internal assessment (CIA) = 50 marks
b) Semester end practical examination (SEE) = 50 marks

The 25 marks for continuous assessment shall further be allocated as under (IA or CIA):

i	Conduction of regular practical throughout the semester	20 marks
ii	Maintenance of lab records /industry reports	15 marks
iii	Laboratory test and viva	15 marks
	Total	50 marks

The 50 marks meant for Semester End Examination, shall be allocated as under:

i	Conduction of semester end practical examination	30 marks
ii	Write up about the experiment / practical conducted	10 marks
iii	Viva Voce	10 marks

	Total	50 marks

10.3.3. The SEE for Practical work will be conducted jointly by internal and external examiners. However, if external examiner does not turn up, then both the examiners will be internal examiners.

10.3.4. In case a course is partly P type i.e, (L=3): (T=0) (P=1), then the examination for SEE component will be as decided by the BoS concerned.

10.3.5. The duration for semester-end practical examination shall be decided by the concerned School Board.

10.4. Evaluation of Internship/Clinical Postings:

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his/her progress in the form of seminars in addition to the regular discussion with the supervisor. At the end of the semester, the candidate has to submitfinal report of the project / dissertation, as the case may be, for final evaluation. The componentsof evaluation are as follows:

1	Internship/Clinical Postings	Should be done a semester before the project semester	Weightage: 0%
2	Internship/Clinical Postings	7^{th} week from the start date of project semester	Weightage: 25%
3	Internship/Clinical Postings	14^{th} Week from the start date of project semester	Weightage: 25%
4	Internship/Clinical Postings	17^{th} -20^{th} Week of project Semester	Weightage: 30% for Dissertation Weightage : 20% for Final Viva Voce

10. Provision for Appeal

If a candidate is not satisfied with the evaluation of C1,C2 components, he/she can approach the grievance cell with the written submission together with all facts, the assignments, test papers etc, which were evaluated. He/she can do so before the commencement of semester-end examination. The grievance cell is empowered to revise the marks if the case is genuine and is also empowered to levy penalty as prescribed by the university on the candidate if his/her submission is found to be baseless and unduly motivated. This cell may recommend taking disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the grievance cell is final.

For every program there will be one grievance cell. The composition of the grievance cell is as follows:-

- The Registrar (Evaluation) - Ex-officio Chairman / Convener
- One Senior Faculty Member (other than those concerned with the evaluation of the course concerned) drawn from the school / department/discipline and/or from the sister schools / departments/sister disciplines – Member.
- One Senior Faculty Members / Subject Experts drawn from outside the University school / department – Member.

11. Requirements to Pass the Semester

To pass the semester, a candidate has to secure minimum of 40% marks in each subject / course of the study prescribed in that semester.

11.1 Provision to Carry Forward the Failed Subjects / Courses:

A student who has failed in a given number of courses in odd and even semesters of first year shall move to third semester of second and final year of the study. However, he / she shall have to clear

all courses of all semesters within the double duration, i. e., within six years of admission of the first semester failing which the student has to re-register to the entire program.

13.2. Provision **to Withdraw Course:**

A candidate can withdraw any course within ten days from the date of notification of final results. Whenever a candidate withdraws a course, he/she has to register for the same course in case it is hard core course, the same course or an alternate course if it is Soft Core Course or Open Elective Course.
A DROPPED course is automatically considered as a course withdrawn.

13.3. Re-Registration and Re-Admission:

a) In case a candidate's class attendance in aggregate of all courses in a semester is less than 75% or as stipulated by the University, such a candidate is considered as dropped the semester and is not allowed to appear for end semester examination (C3) and he / she shall have to seek re-admission to that semester during subsequent semester / year within a stipulated period.

b) In such case where in a candidate drops all the courses in a semester due to personal reasons, it is considered that the candidate has dropped the semester and he / she shall seek re- admission to such dropped semester.

12. Attendance Requirement:

12.1 All students must attend every lecture, tutorial and practical classes, clinical postings.

12.2 In case a student is on approved leave of absence (e g:- representing the university in sports, games or athletics, placement activities, NCC, NSS activities and such others) and / or any other such contingencies like medical emergencies, the attendance requirement shall be minimum of 75% of the classes taught.

a) Any student with less than 75% of attendance in aggregate of all the courses including practical courses / field visits etc, during a semester shall not be permitted to appear to the end semester (C4) examination and such student shall seek re-admission as provided in 7.8.4.

b) Teachers offering the courses will place the above details in the School Board meeting during the last week of the semester, before the commencement of C3, and subsequently a notification pertaining to the above will be brought out by the Director of the School before the commencement of C3 examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

13. Absence during Mid Semester Examination:

In case a student has been absent from a mid-semester (C1,C2) examination due to the illness or other contingencies he / she may give a request along with necessary supporting documents and certification from the concerned class teacher / authorized personnel to the concerned Head of the School, for make-up examination. The Head of the School may consider such request depending

on the merit of the case and after consultation with course instructor and class teacher, and arrange to conduct a special test for such candidate(s) well in advance before the C3 examination of that respective semester. Under no circumstances C1,C2 test shall be held after C3 examination.

14. Grade Card and Grade Point

16.1. Provisional Grade Card: The tentative / provisional grade card will be issued by the Registrar (Evaluation) at the end of every semester indicating the courses completed successfully. The provisional grade card provides **Semester Grade Point Average** (SGPA).

16.2. Final Grade Card: Upon successful completion of M.Sc., Degree a Final Grade card consisting of grades of all courses successfully completed by the candidate will be issued by the Registrar (Evaluation).

16.3. The Grade and the Grade Point: The Grade and the Grade Point earned by the candidate in the subject will be as given below.

Marks P	Grade G	Grade Point (GP=V x G)	Letter Grade
90 >100	10	v*10	O
80 > 90	9	v*9	A+
70 > 80	8	v*8	A
60 > 70	7	v*7	B+
55 > 60	6	v*6	B
50 > 55	5.5	V*5.5	C +
40 > 50	5	v*5	P
0-40	0	v*0	F
ABSENT			AB

O - Outstanding; A-Excellent; B-Very Good; C-Good; D-Fair; E-Satisfactory; F - Fail

Here, P is the percentage of marks (P=[C1+C2+C3]) secured by a candidate in a course which is **rounded to nearest integer**. V is the credit value of course. G is the grade and GP is the grade point.

16.3.1. Computation of SGPA and CGPA

The Following procedure to compute the Semester Grade Point Average (SGPA)

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student in a given semester, i.e:

SGPA (Si) = ∑(Ci x Gi) / ∑Ci where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

Illustration for Computation of SGPA and CGPA

Illustration No. 1

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course 1	4	A+	9	4X9=36
Course 2	4	A	8	4X8=32
Course 3	3	B+	7	3X7=21
Course 4	3	O	10	3X10=30
Course 5	3	P	5	3X5=15
Course 6	3	B	6	3X6=18
Course 7	2	O	10	2X10=20
Course 8	2	A	8	2X8=16
	24			188

Thus, **SGPA = 188 ÷ 24 = 7.83**

Illustration No. 2

Course	Credit	Grade letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	4	A	8	4X8=32

Course 2	4	B+	7	4X7=28
Course 3	3	A+	9	3X9=27
Course 4	3	B+	7	3X7=21
Course 5	3	B	6	3X6=18
Course 6	3	P	5	3X5=15
Course 7	2	B+	7	2X7=21
Course 8	2	O	10	2X10=20
	24			175

Thus, **SGPA = 175 ÷ 24 = 7.29**

Illustration No.3

Course	**Credit**	**Grade Letter**	**Grade Point**	**Credit Point (Credit x Grade point)**
Course 1	4	O	10	4 x 10 = 40
Course 2	4	A+	9	4 x 9 = 36
Course 3	3	B+	7	3 x 7 = 21
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	B+	7	3 x 7 = 21
Course 7	2	A+	9	2 x 9 = 18
Course 8	2	A+	9	2 x 9 = 18
	24			199

Thus**, SGPA = 199 ÷ 24 = 8.29**

Cumulative Grade Point Average (CGPA):

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits (96) for Two year Post Graduate degree program is calculated taking into account all the courses undergone by a student over all the semesters of a program i. e.,

CGPA = $\sum$(Ci x Si) / $\sum$Ci

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Illustration: No.1

CGPA after Final Semester

Semester (ith)	No. of Credits (Ci)	SGPA (Si)	Credits x SGPA (Ci X Si)
1	24	6.83	24 x 6.83 = 163.92
2	24	7.71	24 x 7.71 = 185.04
3	24	8.68	24 x 8.68 = 208.32
4	24	9.20	24 x 9.20 = 220.80
Cumulative	96		778.08

Thus, CGPA = 24x6.83+24x7.13+24x8.68+24x9.20 = 8.11

96

16.3.2. CONVERSION OF GRADES INTO PERCENTAGE:

Conversion formula for the conversion of CGPA into Percentage is:

Percentage of marks scored = CGPA Earned x 10

Illustration: CGPA Earned 8.10 x 10=81.0

16.3.3. Classification of Results

The final grade point (FGP) to be awarded to the student is based on CGPA secured by the candidate and is given as follows.

CGPA	Grade (Numerical Index) G	Letter Grade	Performance	FGP Qualitative Index
9 >= CGPA 10	10	O	Outstanding	Distinction
8 >= CGPA < 9	9	A+	Excellent	
7 >= CGPA < 8	8	A	Very Good	First Class
6 >= CGPA < 7	7	B+	Good	
5.5> = CGPA < 6	6	B	Above average	Second Class
> 5 CGPA < 5.5	5.5	C	Average	
> 4 CGPA <5	5	P	Pass	Satisfactory

Overall percentage=10*CGPA

15. Challenge Valuation

a. A student who desires to apply for challenge valuation shall obtain a photo copy of the answer script by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the grade awarded to him/her by surrendering the grade card and bysubmitting an application along with the prescribed fee to the Registrar (Evaluation) within 10 days after the announcement of the results. This challenge valuation is only for SEE.

The answer scripts for which challenge valuation is sought for shall be evaluated by the external examiner who has not involved in the first evaluation. The higher of two marks from first valuation and challenge valuation shall be the final.

b. With regard to any specific case of ambiguity and unsolved problem, the decision of the

Vice-Chancellor shall be final.

Mapping of PEOS with Respect to Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PE01	√	√	√	√	√	√	√	√

PE02	√	√	√	√	√	√	√	√	√	√
PE03	√	√	√	√	√	√	√	√	√	√

Attainment of CO (Course Outcome)

CO Attainment	**Value**
0.4 - 0.6	1
0.6 – 0.75	2
> 0.75	3

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0101	CO1	3	2	3	3	3	2	2	2	2	1	1
	CO2	2	3	1	3	1	3	2	2	1	1	1
	CO3	1	2	2	3	1	3	3	3	2	1	2
	CO4	3	3	2	3	1	3	2	3	1		2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0102	CO1	2	3	3	3	1	2	2	3	2	1	2
	CO2	3	2	3	3	1	2	2	3	2	2	1
	CO3	2	2	3	3	2	1	3	3	1	1	2
	CO4	3	3	2	3	1	1	3	2	2	1	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA01 03	CO1	2	3	2	3	1	3	1	1	1	2	2

	CO2	2	3	3	3	1	1	2	3	2	2	2
	CO3	3	3	3	2	1	1	2	1	1	2	1
	CO4	3	2	1	3	1	3	2	3	1	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0104	CO1	3	1	3	3	2	1	3	2	1	1	1
	CO2	3	3	2	3	1	1	2	3	1	2	2
	CO3	2	3	2	3	2	1	2	3	2	1	1
	CO4	1	3	2	3	2	3	2	3	2	2	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0105	CO1	3	3	1	2	1	1	2	---	1	1	1
	CO2	2	2	1	--	--	--	1	--	1	1	2
	CO3	3	2	1	2	--	1	1	--	2	2	2
	CO4	3	3	2	3	--	1	1	--	2	1	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0106	CO1	2	2	3	3	1	2	3	1	1	1	2
	CO2	3	2	2	3	3	2	2	2	2		1
	CO3	2	3	3	3	3	2	3	3	2	1	2
	CO4	1	3	3	3	2	2	3	3	1		2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0201	CO1	3	2	3	3	2	1	1	2	1	1	2
	CO2	2	3	2	3	1	1	3	2	2	1	2
	CO3	2	2	3	3	1	2	3	2	2	2	2
	CO4	2	3	3	3	2	3	3	3	2	1	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0202	CO1	3	2	2	2	1	1	2	3	2	1	2
	CO2	3	3	2	3	2	1	2	3	1	2	2
	CO3	2	3	2	3	1	2	2	2	1	1	2

	CO4	2	2	2	3	2	3	2	3	1	2	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA02 03	CO1	3	1	1	3	1	2	2	1	2	1	1
	CO2	3	1	1	3	1	2	2	1	1	1	2
	CO3	3	1	1	3	1	2	3	1	1	1	1
	CO4	3	1	1	3	1	2	2	1	2	2	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA02 04	CO1	3	2	1	3	1	1	2	2	2	2	1
	CO2	3	2	2	3	1	1	2	2	1	2	2
	CO3	3	3	3	2	2	2	3	3	1	2	2
	CO4	2	3	3	3	2	2	3	3	2	2	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA02 05	CO1	3	1	2	2	--	1	1	--	1	1	2
	CO2	3	2	2	3	--	1	2	--	1	2	1
	CO3	3	3	2	1	--	1	2	--	2	1	2
	CO4	3	3	2	3	--	1	2	--	1	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0206	CO1	1	3	2	2	3	2	3	3	1	1	2
	CO2	1	3	3	3	1	1	3	3	2	2	1
	CO3	1	3	3	3	1	2	2	3	1	1	2
	CO4	2	3	2	3	1	2	2	2	2	2	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0301	CO1	3	3	2	3	1	1	2	3	1		2
	CO2	3	3	2	3	1	1	2	3	2	1	2
	CO3	3	3	2	3	1	1	2	3	2	1	1
	CO4	3	3	2	3	1	1	2	3	1	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3

B21HA0302	CO1	3	3	2	3	3	2	1	2	1	2	2
	CO2	3	3	2	3	3	2	1	2	2	2	2
	CO3	3	3	2	3	2	3	1	2	2	1	1
	CO4	3	3	2	3	2	3	1	2	2	2	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0303	CO1	3	1	1	1	1	1	1	--	1	1	2
	CO2	3	1	1	2	1	1	2	--	2	2	1
	CO3	2	3	2	2	--	1	2	--	1	1	2
	CO4	1	3	3	3	--	1	2	--	2	1	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0305	CO1	2	1	1	1	--	--	--	2	2	1	1
	CO2	2	1	2	1	2	--	--	2	2	2	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0306	CO1	3	3	3	3	1	1	3	2	2	1	1
	CO2	3	2	1	3	1	3	1	3	2	1	2
	CO3	3	1	1	3	1	3	1	2	2	2	1
	CO4	3	3	3	3	1	3	2	3	1	1	2
	CO5	3	3	2	3	1	3	1	2	2	1	2
	CO6	3	3	1	3	1	3	2	2	2	2	1
Course Code	POS/ COs	PO1	P02	PO3	PO4	PO5	PO6	P7	PO8	PS O1	PS O2	PS O3
B21HA03 07	CO1	3	3	2	2	1	2	2	2	2	2	1
	CO2	3	3	2	2	1	3	2	2	1	1	2
	CO3	3	3	1	2	1	2	3	3	2	1	2
	CO4	3	3	1	2	1	3	3	3	2	1	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA03 08	CO1	1	3	2	2	--	1	2	--	2	1	1
	CO2	1	3	3	2	--	--	1	--	2	2	1

	CO3	2	3	2	3	--	--	--	--	1	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA04 01	CO1	3	3	2	3	1	2	2	3	1	1	2
	CO2	3	3	2	3	1	2	2	3	2	2	1
	CO3	3	3	1	3	1	1	2	2	1	1	2
	CO4	3	3	1	3	1	1	2	2	2	2	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA04 02	CO1	3	2	3	3	1	1	2	3	1	1	2
	CO2	2	3	2	3	1	1	2	3	2	2	1
	CO3	3	3	2	2	1	1	2	3	1	1	2
	CO4	2	3	1	3	1	1	2	3	1	2	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA04 03	CO1	3	2	2	1	--	1	--	--	1	2	2
	CO2	2	2	2	2	--	--	--	--	2	2	1
	CO3	3	1	1	2	--	1	1	--	1	1	2
	CO4	2	3	3	1	--	1	--	--	1	2	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0404	CO1	3	3	2	1	1	1	2	3	1	2	2
	CO2	2	3	3	2	1	1	2	2	1	1	2
	CO3	3	2	3	1	1	2	3	2	1	1	1
	CO4	2	3	2	1	1	1	2	2	2		1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA04 06	CO1	3	3	1	3	1	2	3	1	1	2	1
	CO2	3	3	1	3	1	2	3	1	1	1	2
	CO3	3	3	1	3	1	2	3	1	1	2	2
	CO4	3	3	1	3	1	2	3	1	1	1	1
	CO5	3	3	1	3	1	2	3	1	1	2	1

Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA04 07	CO1	1	3	2	2	--	--	1	--	2	2	2
	CO2	1	3	3	2	--	--	1	--	1	2	1
	CO3	2	2	2	2	--	1	1	--	2		1
	CO4	1	2	2	1	--	--	1	--	1	2	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0408	CO1	3	1	1	3	1	2	2	1	2	1	2
	CO2	3	1	1	3	1	2	2	1	2		1
	CO3	3	1	1	3	1	2	2	1	2	2	1
	CO4	3	2	3	3	1	1	2	3	2	1	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA05 01	CO1	3	2	2	3	1	2	3	3	1	1	1
	CO2	2	3	3	3	1	3	2	2	1	1	2
	CO3	3	2	3	3	1	2	2	3	2	1	1
	CO4	2	3	3	3	1	2	2	3	2	1	1
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA05 02	CO1	3	1	1	1	--	--	--	--	1	1	2
	CO2	2	3	2	2	1	--	1	--	2	1	1
	CO3	3	3	2	2	--	--	--	--	2	1	1
	CO4	3	1	1	2	--	--	--	--	2	2	1
Course Code	POS/ COs	PO1	P02	PO3	PO4	PO5	PO6	P7	PO8	PS O1	PS O2	PS O3
B21HA05 03	CO1	3	3	1	2	1	2	3	3	1	2	2
	CO2	3	3	1	2	1	2	3	3	1	1	1
	CO3	3	3	1	2	1	2	3	3	2	1	1
	CO4	3	3	1	2	1	2	3	3	2	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA05 05	CO1	3	3	2	3	1	2	3	2	2	1	1

	CO2	3	3	2	3	2	1	3	3	2	2	1
	CO3	2	3	2	3	1	1	3	3	1	1	2
	CO4	1	3	2	1	1	2	2	2	1	2	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA05 06	CO1	1	3	3	2	--	1	1	1	1	1	2
	CO2	1	3	3	2	--	1	1	1	2	2	1
	CO3	1	3	3	2	--	1	1	1	2	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA0507	CO1	3	2	2	3	1	2	1	2	2	2	1
	CO2	3	3	1	3	1	3	1	2	1	1	2
	CO3	3	3	1	3	1	3	1	2	2	2	1
	CO4	3	3	1	3	1	3	1	2	1	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA06 01	CO1	3	2	3	3	2	3	2	1	1	1	2
	CO2	3	3	3	2	2	2	2	3	2	2	1
	CO3	3	3	2	3	3	2	1	2	1	1	1
	CO4	2	2	3	3	3	2	1	3	1	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA06 02	CO1	3	1	1	1	--	1	2	--	2	1	2
	CO2	3	1	--	--	3	2	3	--	1	2	2
	CO3	1	2	2	2	--	--	1	--	1	2	2
	CO4	1	2	1	2	--	--	1	--	1		2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA06 03	CO1	3	3	1	2	1	2	3	3	1	1	1
	CO2	3	3	1	2	1	2	3	3	1	2	2
	CO3	3	3	1	2	1	2	3	3	1	1	2

	CO4	2	2	3	3	3	2	1	3	1	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA06 04	CO1	3	3	1	2	1	2	3	3	1	1	1
	CO2	3	3	1	2	1	2	3	3	1	2	2
	CO3	3	3	1	2	1	2	3	3	1	1	2
	CO4	2	2	3	3	3	2	1	3	1	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA06 05	CO1	3	3	1	2	1	2	3	3	1	1	1
	CO2	3	3	1	2	1	2	3	3	1	2	2
	CO3	3	3	1	2	1	2	3	3	1	1	2
Course Code	POS/ COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	P 7	PO 8	PS O1	PS O2	PS O3
B21HA06 06	CO1	3	3	1	2	1	2	3	3	1	1	1
	CO2	3	3	1	2	1	2	3	3	1	2	2
	CO3	3	3	1	2	1	2	3	3	1	1	2
	CO4	2	2	3	3	3	2	1	3	1	1	2

Mapping of PEOS with Respect to PO's

	PO1	**P2**	**PO3**	**PO4**	**PO5**	**PO6**	**P7**	**PO8**	**PSO1**	**PSO2**	**PSO3**
PEO1	√	√	√	√	√	√	√	√	√	√	√
PEO2	√	√	√	√	√	√	√	√	√	√	√
PEO3	√	√	√	√	√	√	√	√	√	√	√
PEO4	√	√	√	√	√	√	√	√	√	√	√

B.sc (Medical Laboratory Technology) Program

(Effective from Year 2021-24) Duration: 6 Semesters (3 Years)

CC = Core Course; SEC= Skill Enhancement Course; HC = Hard Course
AEC = Ability Enhancement Course

Sl. No.	Course Code	Course Title	Course Type	Credit Pattern andValue				Weekly Contact Hours	Teaching School/Dept.
				L	T	P	C		
First Semester:									
1	B21AHE102	Language- I: Communicativ eEnglish	AEC	1	1	0	2	3	Arts and Humanities
2	B21HA0101	Human Anatomy-I	CC	3	1	0	4	4	Allied health sciences
3	B21HA0102	Human Physiology-I	CC	3	0	0	3	3	Allied health sciences
4	B21HA0103	Biochemistry-I	HC	2	1	0	3	4	Allied health sciences
5	B21HA0104	Microbiology-I	HC	2	1	0	3	4	Allied health sciences
6	B21HA0105	Pathology-I	HC	2	1	0	3	4	Allied health sciences
		Practicals							Allied health sciences
7	B21HA0106	Practical: Human Anatomy-I	HC	0	0	2	2	3	Allied health sciences
Total Credits for the First Semester:							**20**	**25**	

**** Students have to undergo practical training in identified hospitals**

Second semester

SL. No	Course code	Course title	Course Type	Credit Pattern andValue				Weekly Contact Hours	Teaching School/Dept.
				L	T	P	C		

Second Semester:									
1	B21HA0201	Human Anatomy-II	CC	3	0	0	3	3	Allied health Sciences
2	B21HA0202	Human Physiology-II	CC	3	0	0	3	3	Allied health sciences
3	B21HA0203	Biochemistry-II	HC	2	1	0	3	4	Allied health sciences
4	B21HA0204	Microbiology-II	HC	2	1	0	3	4	Allied health sciences
5	B21HA0205	Pathology-II	HC	3	1	0	4	4	Allied health sciences
6	B21LHM201	Constitution of india & professional ethics	MC	0	0	0	0	2	Legal studies
		Practicals							
7	B21HA0206	Practical: Human Physiology-I	HC	0	0	2	2	3	Allied health sciences
8	B21HA0207	Clinical Postings-I	HC	0	0	2	2	5	Allied health sciences
Total Credits for the Second Semester:							**20**	**28**	

Third semester

Sl. No.	Course Code	Course Title	Course Type	Credit Pattern and Value				Weekly Contact Hours	Teaching School/ Dept.
				L	T	P	C		
Third Semester:									
1	B21HA0301	Biochemistry-III	HC	2	1	0	3	4	Allied health sciences
2	B21HA0302	Microbiology-III	HC	2	1	0	3	4	Allied health sciences
3	B21HA0303	Pathology-III	HC	2	1	0	3	4	Allied health sciences
4	B21HA0304	Open Elective	SC	2	0	0	2	4	Allied health sciences

5	B21HA0305	Health Care	SC	2	0	0	2	2	Allied health sciences
		Practicals							
6	B21HA0306	Practical: Biochemistry-I	HC	0	0	2	2	4	Allied health sciences
7	B21HA0307	Practical: Microbiology-I	HC	0	0	2	2	4	Allied health sciences
8	B21HA0308	Practical: Pathology-I	HC	0	0	2	2	4	Allied health sciences
Total Credits for the Third Semester:							**19**	**30**	

Fourth Semester:

Sl. No.	**Course Code**	**Course Title**	**Course Type**	**Credit Pattern and Value**				**Weekly Contact Hours**	**Teaching School/ Dept.**
				L	T	P	C		
1	B21HA0401	Biochemistry-IV	HC	2	1	0	3	4	Allied health sciences
2	B21HA0402	Microbiology-IV	HC	2	1	0	3	4	Allied health sciences
3	B21HA0403	Pathology-IV	HC	2	1	0	3	4	Allied health sciences
4	B21HA0404	Pharmacology	SC	2	0	0	2	4	Allied health sciences
5	B21HA0405	Computer Basics	SC	2	0	0	2	3	Allied health sciences
		Practicals							
6	B21HA0406	Practical: Biochemistry-II	HC	0	0	2	2	4	Allied health

									sciences
7	B21HA0407	Practical: Microbiology-II	HC	0	0	2	2	4	Allied health sciences
8	B21HA0408	Practical: Pathology-II	HC	0	0	2	2	4	Allied health sciences
9	B21HA0409	Clinical Postings-II	HC	0	0	2	2	6	Allied health sciences
Total Credits for the Fourth Semester:							**21**	**37**	

Fifth Semester

Sl. No.	**Course Code**	**Course Title**	**Course Type**	**Credit Pattern and Value**				**Weekly Contact Hours**	**Teaching School/ Dept.**
				L	**T**	**P**	**C**		
1	B21HA0501	Biochemistry-V	HC	2	1	0	3	4	Allied health sciences
2	B21HA0502	Microbiology-V	HC	2	1	0	3	4	Allied health sciences
3	B21HA0503	Biostatistics and Pathology- V	HC	2	1	0	3	4	Allied health sciences
4	B21HAON01	MOOC/SWAYAM	SEC	2	0	0	2	2	
5	B21HA0504	Communicative Medicine	SC	1	1	0	2	3	Allied health sciences
		Practicals							
6	B21HA0505	Practical: Biochemistry-III	HC	0	0	2	2	4	Allied health sciences
7	B21HA0506	Practical: Microbiology-III	HC	0	0	2	2	4	Allied health sciences
8	B21HA0507	Practical: Pathology – III	HC	0	0	2	2	4	Allied health sciences

9	B21HA0508	Clinical Postings-III	HC	0	0	2	2	6	Allied health sciences
Total Credits for the Fifth Semester:							**21**	**33**	

SIXTH SEMESTER

Sl. No.	Course Code	Course Title	Course Type	Credit Pattern and Value				Weekly Contact Hours	Teaching School/ Dept.
				L	T	P	C		
1	B21HA0601	Medical Ethics and Biochemistry-VI	HC	2	1	0	3	4	Allied health sciences
2	B21HA0602	Microbiology-VI	HC	2	1	0	3	4	Allied health sciences
3	B21HA0603	Pathology-VI	HC	2	1	0	3	4	Allied health sciences
4		**Practicals**							
5	B21HA0604	Practical: Biochemistry-IV	HC	0	0	2	2	4	Allied health sciences
6	B21HA0605	Practical: Microbiology-IV	HC	0	0	2	2	4	Allied health sciences
7	B21HA0606	Practical: Pathology –IV	HC	0	0	2	2	4	Allied health sciences
8	B21HA0607	Internship	HC	0	0	4	4	8	Allied health sciences
Total Credits for the Sixth Semester:							**19**	**32**	
Total Credits of all Semesters							**120**	**187**	

Semester-wise Summary of Credit Distribution

Semester	L	T	P	Total	Total Hours
I	12	06	02	20	27
II	13	03	04	20	28
III	11	03	06	19	30
IV	08	05	08	21	37
V	07	04	09	21	33
VI	06	03	10	19	32
Total Credits	**57**	**24**	**39**	**120**	**187**

DETAILED SYLLABUS

SEMESTER I

B21AHE102	LANGUAGE- I: COMMUNICATIVE ENGLISH	**L**	**T**	**P**	**C**
Duration: 3 hrs/wk		**1**	**1**	**0**	**2**

Prerequisites:

Knowledge of intermediate English Grammar and LSRW skills

Course Objectives:

1. To develop basic communication skills in English for the learners of Bachelor of Science.
2. To prioritize listening and reading skills among the learners.
3. To simplify writing skills needed for academic as well as workplace context.
4. To examine that the learners use the electronic media such as internet and supplement the learning materials used in the classroom.

Course Outcomes:

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

CO1. Interpret audio files and comprehend different spoken discourses/ excerpts in different accents (Listening Skills).

CO2. Demonstrate speaking ability with clarity, confidence and comprehension and communicate with one or many listeners using appropriate communicative strategies (Speaking Skills).

CO3. Make use of reading different genres of texts adopting various reading strategies (Reading Skills).

CO4. Develop the ability to write cohesively, coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic (Writing Skills).

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS/ COs	PO1	PO2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21MT1010	CO1					3	3	3	3			
	CO2					3	3	3	2			
	CO3					3	3	3	2			
	CO4					3	3	3	3			

Course Contents:

UNIT –I **12 Hrs**

Functional English: Grammar: Prepositions; Modal Auxiliaries

Listening: Listening to audio (verbal & sounds)

Speaking: Debating Skills

Reading: Skimming a reading passage; Scanning for specific information

Writing: Email communication

UNIT – II **12 Hrs**

Interpersonal Skills: Grammar: Tenses; Wh-questions

Listening& Speaking: Listening and responding to video lectures / talks

Reading: Reading Comprehension; Critical Reading; Finding key information in a given text

Writing: Process descriptions (general/specific); Recommendations

UNIT – III **12 Hrs**

Multitasking Skills: Grammar: Conditional Sentences

Listening & Speaking: Listening to specific task; focused audio tracks and responding

Reading: Reading and interpreting visual material

Writing: Channel conversion (flowchart into process); Types of paragraph (cause and effect / compare and contrast / narrative / analytical); Note Taking/ Note Making

UNIT – IV **12 Hrs**

Communication Skills: Grammar: Direct and indirect speech

Listening & Speaking: Watching videos / documentaries and responding to questions based on them; Role plays

Reading: Making inference from the reading passage; predicting the content of a reading passage

Writing: Interpreting visual materials (line graphs, pie charts etc.); Different types of Essay Writing

B21HA0101	**HUMAN ANATOMY-I**	**L**	**T**	**P**	**C**
Duration: 3 hrs/wk		**3**	**1**	**0**	**4**

Prerequisites:

Students on Completion of study of basic principles of cross-sectional normal anatomy of human body tissue.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To understand the organization of human body, cell and genetics
2. To obtain knowledge regarding the structural organization of skeletal system
3. To understand the structure and functions of muscular system and sense organs
4. To interpret the importance of nervous system and endocrine system

Course Outcomes:

CO1. Ready to explain the organization of components in the Human Body
CO2. Able to understand the structural compositions in skeletal system
CO3. To get knowledge about the structure and functions of muscular system and sense organs
CO4. Able to analyse the nervous system and endocrine system

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0101	CO1	3	2	3	3	3	2	2	2	2	1	1

	CO2	2	3	1	3	1	3	2	2	1	1	1
	CO3	1	2	2	3	1	3	3	3	2	1	2
	CO4	3	3	2	3	1	3	2	3	1	0	2

Course Contents:

UNIT-I **12 Hrs**

Introduction to human body: Definition and subdivision of anatomy, Anatomical position and terminology, Region and systems of the body, Cavities of the body and their contents, Levels of organization of the body

Cell and genetics: Parts of cell – cell membrane, cytoplasm, organelles, inclusion bodies, nucleus. Structure of chromosome, DNA, RNA. Basics & fundamentals of Genetics, Karyotyping, Chromosomal disorders, prenatal diagnosis, genetic counseling and gene therapy. Cell division – Definition and main events that occur in different stages of mitosis and meiosis. Tissues – Definition, characteristic features and types with example. Epithelial Tissue, Types of glands with example.

UNIT–II **12 Hrs**

Skeletal system: Cartilage: Type and basic histological feature. Bones: definition, classification based on location, name and number of bones with general feature of important bones, function of bone, histological feature of a compact bone. Bones of the upper limb, Bones of the lower limb, Bones of the thorax, Bones of the Abdomen and pelvis, Skull and face bones. Joints – Definition and types with example, Axis and movements. Shoulder, elbow, hip, knee joints – type, bones and ligaments involved, possible movements.

UNIT–III **12 Hrs**

Muscular system: Types of muscle with basic histological features, Parts of skeletal muscle.

• Definition of origin and insertion

• Origin, insertion, nerve supply, action of sternocleidomastoid, pectoralis major, deltoid, gluteus maximums and diaphragm.

Sense organs

• Location and features of nose, tongue, eye, ear and skin.

UNIT-IV **12 Hrs**

Nervous system: Subdivisions of the nervous system. Spinal cord-location, extent, external features and blood supply. Brain-subdivision, location, external features of Medulla oblongata, Pons, Midbrain, Cerebellum, and Cerebrum, Thalamus and Hypothalamus, Location andsubdivision of ventricles of brain. Circle of Willis. Cranial nerves-name, number, attachment, area of distribution. Spinal nerves-typical spinal nerve. Name and location of plexuses. Location and distribution of brachial and lumbosacral plexus. Autonomic nervous system-sympathetic and parasympathetic nervous system. Location of pre-ganglionic and post-ganglionic neurons.

Endocrine system: Names of the endocrine glands. Location and features of pituitary, thyroid, parathyroid, suprarenal, pancreas, ovaries and testis. Names of hormones produced by each gland. Microscopic features of thyroid and pancreas.

Reference Books:

1. Human Anatomy by Inderbir Singh
2. Manipal manual for AHS by Dr. Sampath Madhyastha, (Second Edition) Published by CBS Publishers.
3. Handbook of anatomy for nurses by Dr. P. Saraswathi.
4. Text book of anatomy BD-CHAURASIA-LATEST EDITION.
5. Theory and Practice of histological techniques by Bancroft(jd).
6. Ross & Wilson Anatomy & Physiology in Health & Illness by Waugh (A)
7. Text Book of Human histology by Inderbir Singh
8. Theory and Practice of Histological Techniques by Bancroft (JD)
9. Human Genetics by Gangane (SD)
10. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition, Elsevier Publications
11. Chaurasia B D, (2016), Human Anatomy, 7th edition, CBS publishers
12. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th edition,Wiley Publications.

B21HA0102	HUMAN PHYSIOLOGY-I	L	T	P	C
Duration: 3 hrs/wk		3	0	0	3

Prerequisites:

Students on Completion of study of basic principles of Human organs and systems functions.

To know about blood cell, blood component, lymphatic system and related lab technique

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course objectives

1. **To know about the** cardiovascular system, cardiac cycle, blood pressure & heart rate and ECG
2. To know about nerve cell & nervous system, nerve impulse, EEG and about the sense organ
3. To understand the endocrine system and sense organs

Course Outcomes:

CO1. Achieve knowledge about blood cell, blood component, lymphatic system and related lab technique

CO2. Able to understand cardiovascular system, cardiac cycle, blood pressure & heart rate and ECG measurement

CO3. Able to understand nerve cell & nervous system, nerve impulse, EEG and about the sense organ

CO4. Ready to understand the endocrine system and sense organs

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0102	CO1	2	3	3	3	1	2	2	3	2	1	2
	CO2	3	2	3	3	1	2	2	3	2	2	1
	CO3	2	2	3	3	2	1	3	3	1	1	2
	CO4	3	3	2	3	1	1	3	2	2	1	1

Course Contents:

UNIT- I **12Hrs**

Blood-composition, function, cellular component & their function, haemoglobin & anaemia, blood groups and coagulation. Haematocrit, ESR, blood volume measurements. RBC, WBC & platelet counts, names of developmental stages of RBC, functions and fate of RBC. Functions of WBC and platelets. Lymphatic System-Composition & function of lymph, lymphatic tissue, Immunity with the role of thymus

UNIT- II **12Hrs**

Cardiovascular system-general arrange, heart, arteries, veins and capillaries, heart structure and function, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition of hypertension & shock, definitions of cardiac output, stroke volume, principles of measurements of cardiac output. ECG– methods of recording and ECG waves. Normal values of blood pressure, heart rate and their regulation in brief.

UNIT- III **12Hrs**

Neuron: Structure of neuron, nerve impulse, myelinated and non-myelinated nerve. Brief accountof resting membrane potential, action potential and conduction of nerve impulse. Function ofimportant structure and spinal cord, type of nerves according to function, Autonomic nervous system-organization & function. Neuro-muscle transmission. Various parts of nervous system, C.S.F., Functions of muscle spindle and motor tracts including reflexes, cutaneous receptors, joint receptors, sensory pathways. Ascending reticular formation, EEG, functions of cerebellum, basal ganglia, thalamus & hypothalamus, vestibular apparatus and functions.

UNIT- IV **12Hrs**

Endocrine System: Names of endocrine glands & their secretions, functions of various hormones. Brief account of endocrine disorders. Common endocrinological disorder such as diabetes mellitus, hyper & hypothyroidism, dwarfism, gigantism, tetany.

Sense organs: Special senses-general organization & functions (vision, hearing, taste & smell)

References:

1. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition, Elsevier Publications
2. Sujit Chaudhury,(2011),Concise Medical Physiology,6th edition, NCBA
3. Sembulingam k,(2012),Essentials of Medical Physiology,6th edition, Jaypee Publications
4. Guyton and Hall,(2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier
5. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology, 14th edition, Wiley publications
6. Textbook of Medical Physiology by G.K. Pal.
7. Review of Medical Physiology by Ganong.
8. Samson Wrights Applied Physiology.
9. Text book of Medical physiology by A.B. Das Mahapatra.

B21HA0103	BIOCHEMISTRY -I	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Students on Completion of study of terminology and basic principles of common instruments used in Biochemistry laboratory, basic concepts of acids and bases and simple calculations of preparationof normality and molarity.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To understand the knowledge of medical laboratory, apparatus handling and maintenance
2. To understand about the basic instruments used in the laboratory
3. To recognize about the preparation of reagents and buffers with units and measurements
4. To know about the collection and processing of biological samples

Course Outcomes:

CO1. Apply knowledge on safety rules and ethics in the practice of medical laboratory.

CO2. Acquire knowledge to explain the principles and the operation mode of the most used analytical equipments used in biochemistry lab.

CO3. Apply knowledge on reagents and buffer preparations and their applications.

CO4. Ascertain the collection and processing of blood samples .

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0103	CO1	2	3	2	3	1	3	1	1	1	2	2
	CO2	2	3	3	3	1	1	2	3	2	2	2

	CO3	3	3	3	2	1	1	2	1	1	2	1
	CO4	3	2	1	3	1	3	2	3	1	1	2

Course Contents:

UNIT- I **12Hrs**

Role of Medical Laboratory technologists – ethics of laboratory practice. Laboratory safety – Common lab accidents their prevention and their first aid. General laboratory layout as applicable to biochemistry. Glassware's & plastic ware's used in lab, calibration of volumetric apparatus, cleaning, care and maintenance.

UNIT-II **12Hrs**

Instruments (Theory and demonstration): Principle, working, care & maintenance and calibration of Weighing balance, Hotplate, Magnetic stirrer, Centrifuges, Lyophilizer Incubator, Hot air oven, Colorimeter, Spectrophotometer, Water distillation plant, Deionizers, pH paper, pH meter, method of pH measurement. Types of electrodes, salt bridge solution. Use, care and maintenance of electrodes.

UNIT-III **12Hrs**

Preparation of solution and reagents, Hypo, Hyper, Isotonic solutions, Normality, Molality, Molarity, percent solution, dilutions, w/v, v/v, standard solution. Body fluid dilutions. Units of measurement: SI unit, reference range, units for measurement of enzymes, protein, drugs, hormones, vitamins. Concepts of acid base, hydrogen ion concentration. Ionization of water. Buffers, types, Henderson Hassel back Equation, pH value of a solution, preparation of buffer solutions. Indicators and its types.

Quality control: Accuracy, Precision, Specificity, Sensitivity.

UNIT- IV **12Hrs**

Specimen collection and processing of blood, urine & CSF, separation of serum and plasma, deproteinization of sample, handling of specimens for testing, preservation of specimen, transport of specimen, factors affecting the clinical results, effect of storage on sample.

References:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition, Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha Science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers
6. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
7. Text book of Medical Biochemistry by Ramakrishna
8. Text Book of Clinical chemistry by Norbert Teitz 4. Principles and Techniques of Practical Biochemistry by Wilson and Walker.
9. Clinical Chemistry - Principle and techniques by Rj Henry, Harper & Row Publishers.
10. Schaum's Outline of Biochemistry.Philip W. Kuchel, Ph.D, Simon Easterbrook-Smith, Vanessa Gysbers, J. Mitchell Guss
11. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology
12. Pearson's Biochemistry.Christopher K. Mathews, Kensal E. van Holde,Dean R. Appling,Spencer J. Anthony-Cahill
13. Biochemistry. Donald Voet, Judith G. Voet

B21HA0104	MICROBIOLOGY-I	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Students on Completion of study of microbial cell structure and function and basic principles of sterilization, disinfection and Microscope.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To learn the fundamental aspects of microbiology including taxonomy and classification
2. To understand about different kinds of microscopes used in the microbiology laboratory
3. To learn about gram staining for the identification of bacteria
4. To learn about disinfection methods used to control contamination of microorganisms

Course Outcomes:

CO1. Ascertain about the fundamental aspects of microbiology including taxonomy and classification.

CO2. Acquire the knowledge of microscopes used in the microbiology laboratory.

CO3. Ascertain the knowledge of gram staining method used in microbiology.

CO4. Acquire the knowledge of about disinfection methods used to control contamination of microorganisms.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0104	CO1	3	1	3	3	2	1	3	2	1	1	1
	CO2	3	3	2	3	1	1	2	3	1	2	2
	CO3	2	3	2	3	2	1	2	3	2	1	1
	CO4	1	3	2	3	2	3	2	3	2	2	1

Course Contents:

UNIT-I **12Hrs**

Fundamentals of Microbiology: Introduction, History and Scope of Microbiology. Microbes and origin of life, History and scope of Microbiology as a modern science, Contribution of Scientists to the field of Microbiology- Antony Von Leewenhoek, Edward, Jenner, LazaroSpallanzani, Louis Pasteur, Joseph Lister, Robert Koch, Alexander Flemming and lwanovsky. Introduction to bacterial taxonomy, Classification of Bacteria.

UNIT-II **12Hrs**

Instruments used in Microbiology: Microscopy: Study of compound microscope – magnification, numerical aperture, resolution and components of microscope. Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron

Microscope, Scanning Electron Microscope.

UNIT-III **12Hrs**

Stains and Staining Techniques, Nature of dyes, Physical and chemical theories of staining, Staining techniques –principle, procedure and applications of a) Simple staining – negative staining

b) Differential Staining- Grams and Acid fast staining

c) Structural staining – cell wall, endospore, flagella and capsular staining.

UNIT-IV **12Hrs**

Methods to Control Microorganism: Definition of sterilization, Autoclave and serum inspirator. Various physical methods of sterilization –UV radiation, ionizing radiation, ultrasonic and sonic vibrations, filtration, Types of drying: dry heat (flaming, incineration, hot air) Hot-Air oven& moist heat (pasteurization, boiling) Autoclave, factors affecting sterilization and sterilization indicators. Definition of disinfection, types, qualities of good disinfectants. Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound, abuse of disinfectants, Precautions while using the disinfectants.

References:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. RobertyCruckshank – Medical Microbiology – The Practice of Medical Mircrobiology
3. Medical Microbiology by R. Cruickshanketal ,vol.I ELBS

B21HA0105	PATHOLOGY- I	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Students on Completion of study of Basic Concepts of Pathology and terminologies used in the subject.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To discuss about the history, basic concept of pathology, safety and basic histotechnology
2. To reveal blood composition blood cell & plasma, coagulation factors and blood cell formation
3. To discuss about RBC, hemoglobins, oxygen dissociation curve and study of blood group
4. To explain about sectioning, staining of tissue and various types of stain

Course Outcomes:

CO1. To aware about the history and basic concept of pathology, safety and basic histotechnology.

CO2. To know about blood cell & plasma composition, coagulation factors and stage of blood cell formation.

CO3. To know about RBC, normal and abnormal hemoglobins, oxygen transport and blood group system.

CO4. To learn about sectioning, staining of tissue and aware about various types of stain

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0105	CO1	3	3	1	2	1	1	2	2	1	1	1
	CO2	2	2	1	--	--	--	1	1	1	1	2
	CO3	3	2	1	2	--	1	1	1	2	2	2
	CO4	3	3	2	3	--	1	1	0	2	1	1

Course Contents:

UNIT-I **12Hrs**

Introduction to Pathology: Introduction & History of pathology, Basic definitions in pathology, laboratory organization, care & maintenance of equipment used in histotechnology lab Safety measures in histotechnology lab Reception, Recording, Labelling and transportation of tissue specimens, Basic concepts of fixation and various types of fixative used in histopathology and cytopathology

UNIT-II **12Hrs**

Overview of hemostasis and coagulation, Stages of platelets development, Primary and Secondary hemostasis, Role of platelets, Role of coagulation factors, Coagulation inhibitory system, Fibrinolysis. Leukopoiesis, Stages of Leukocyte Maturation, Features of Cell Identification, leucocytosis and leucocytopenia, neutrophilia, eosinophilia, basophilia, monocytosis,lymphocytosis, neutropenia, lymphopenia, causes and significance, toxic granulation, Morphological alterations in neutrophil, effect of HIV on blood cell parameter.

UNIT-III **12Hrs**

RBCs, formation, morphology, cytoskeleton, anisocytosis, poikilocytosis, metabolism, role of 2, 3-BPG and oxygen dissociation curve. Haemoglobin, its synthesis and types, normal and abnormal hemoglobins, extravasccular and intravascular hemolysis. Methods of blood group determination, forward and reverse grouping, Slide & Tube method, Gel method, other blood group system such as Lewis, MNS, Kell Duffy etc.

UNIT-IV **12Hrs**

Cryostat, frozen sections of fresh, fixed and unfixed tissue, freeze drying, rapid frozen sections and staining for emergency diagnosis Dye chemistry, Stains and dyes, natural dye, acidic dye, basic dye, neutral dyes, fluorescence dye, mordant, accelerators, accentuators, metachromasia, metachromatic dyes. Leishmann stain.

Short term training

1. Origin, development, morphology, maturation, function and fate of blood cells, nomenclature of blood cells.
2. Various methods of blood collection, anticoagulants-mechanism and uses.
3. Counting chamber- hemocytometry. Enumeration of RBC including various counting chambers, diluting fluids for RBC count.
4. Hemoglobinometry. Principles and methods of quantitating Hb. Concentration of blood including knowledge of errors and quality control in various method. Abnormal hemoglobin and its investigation.
5. Leukemias – definition, causes, classification, detection of leukemia. Total leucocyte count in leukemias. Multiple myeloma.
6. Blood Coagulation and disorders of hemostasis. Principles and methods of assessment of coagulation. BT, CT, Prothrombin time, partial thromboplastin time, chrombic time.

References:

1. Textbook of Pathology, 6th Edition, 2013 by Harsh Mohan
2. A Short Textbook of Pathologyby Sajal Md Tahminur Rahman, Charu Hosne Ara Tahmin, Sajani Tabassum Tahmin, Sarnali Tanjila Tahmin (2013)Edition
3. Text book of Medical Laboratory Technology
4. Robbins and Cotran pathologic basis of disease (2009)

B21HA0106	HUMAN ANATOMY-I (Pratical)	L	T	P	C
Duration:3 hrs/wk		0	0	2	2

Prerequisites:

Students on Completion of study of how to handle and use microscope.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To demonstrate about heart, vessel, atery and vein
2. To see microscopic image of artery and vein in heart
3. To know about histology of lymph node, spleen, tonsil & thymus
4. To learn radiograph, angiogram, demonstration about reflection and parts of urinary system
5. To know about histology of kidney, ureter, urinary bladder
6. To learn about histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tubes, ovary
7. To know about radiographs of abdomen-IVP, retrograde cystogram and pelvis – hysterosalpingogram

Course Outcomes:

CO1. To get knowledge of heart, vessel, atery and vein and achieve visual knowledge of artery and vein in heart

CO2. Ready to explain about lymph node, spleen, tonsil & thymus

CO3. Able to explain radiograph, angiogram, demonstration about reflection and parts of urinary system and able to discuss about histology of kidney, ureter, urinary bladder

CO4. Able to discuss about histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tubes, ovary and handle radiographs of abdomen-IVP, retrograde cystogram and pelvis – hysterosalpingogram.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0106	CO1	2	2	3	3	1	2	3	1	1	1	2
	CO2	3	2	2	3	3	2	2	2	2		1
	CO3	2	3	3	3	3	2	3	3	2	1	2
	CO4	1	3	3	3	2	2	3	3	1		2

Practicals

1. Demonstration of heart and vessels in the body
2. Histology of large artery, medium sized artery & vein, large vein
3. Microscopic appearance of large artery, medium sized artery & vein, large vein Pericardium.
4. Histology of lymph node, spleen, tonsil & thymus
5. Normal chest radiograph showing heart shadows, normal angiograms.
6. Demonstration of reflections
7. Demonstration of parts of urinary system
8. Histology of kidney, ureter, urinary bladder
9. Radiographs of abdomen-IVP, retrograde cystogram
10. Demonstration of section of male and female pelves with organs in situation
11. Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tubes, ovary
12. Radiographs of pelvis – hysterosalpingogram.

References:

1. Manipal manual for AHS by Dr. Sampath Madhyastha, (Second Edition) Published by CBSPublishers.
2. Handbook of anatomy for nurses by Dr. P. Saraswathi.
3. Text book of anatomy BD-CHAURASIA-LATEST EDITION.
4. Theory and Practice of histological techniques by Bancroft(jd

B21HA0201	HUMAN ANATOMY- II	L	T	P	C
Duration: 3 hrs/wk		3	0	0	3

Prerequisites:

Acquire knowledge on cardiovascular system, respiratory system, digestive system, and endocrine system

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To learn the fundamental aspects of cardiovascular and lymphatic system
2. To develop the learning aspects of respiratory and digestive system
3. To Summarize the fundamental aspects of urinary and reproductive system
4. To assess the anatomical techniques related to human anatomy

Course Outcomes:

CO1. Assess the fundamental aspects of cardiovascular and lymphatic system
CO2. Understand the working of respiratory and digestive system
CO3. Able to relate and differentiate the urinary and reproductive system
CO4. Demonstrate the anatomical techniques related to human anatomy

Mapping of Course Outcomes with Programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0201	CO1	3	2	3	3	2	1	1	2	1	1	2
	CO2	2	3	2	3	1	1	3	2	2	1	2
	CO3	2	2	3	3	1	2	3	2	2	2	2
	CO4	2	3	3	3	2	3	3	3	2	1	1

Course Contents:

UNIT-I **12Hrs**

Cardio vascular system: Types and general features of blood vessels. Structure and types of arteries and veins. Shape, size, location, covering, external and internal features of Heart, Conducting system of heart. Blood supply to the heart. Name, location, branches and main distribution of principal arteries and veins

Lymphatic system: General features of Lymph node and lymphatic vessels. Name, location, external features, microscopic feature of tonsil and spleen.

UNIT–II **12Hrs**

Respiratory system: Name the organs of respiration. Location and features of Nasal cavity,pharynx, larynx, trachea, lung & pleura. Mention the microscopic feature of lung.

Digestive system: Name the parts of the alimentary canal and accessory organs. Location & features of esophagus, stomach, small and large intestine. Location and feature of tongue, salivary glands, pancreas, liver and gall bladder. Microscopic feature of liver.

UNIT-III **12Hrs**

Urinary system: Names of urinary organs. Location and features of kidney, ureter, urinary bladder & urethra. Microscopic feature of kidney.

Reproductive system: Names of male and female organs of reproduction. Location and features of testis, epididymis, vas deferens, prostate gland and spermatic cord. Location & features of uterus, uterine tube, ovary and breast.

UNIT-IV **12Hrs**

Embryology: Structure of gametes & gametogenesis. Fertilization to development of embryo till 3rd week. Derivatives of germ layers. Teratogens, Structure and Functions of placenta.

Anatomical Techniques: Embalming of human cadaver, Museum Techniques, Basic principles of Karyotyping.

References:

1. Human Anatomy by Inderbir Singh

2. Ross & Wilson Anatomy & Physiology in Health & Illness by Waugh (A)
3. Text Book of Human histology by Inderbir Singh
4. Theory and Practice of Histological Techniques by Bancroft (JD)
5. Human Genetics by Gangane (SD)
6. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition, Elsevier Publications
7. Chaurasia B D, (2016), Human Anatomy, 7th edition, CBS publishers
8. Gerard J. Tortora and Bryan H.Derrickson, (Principles of Anatomy and Physiology, 14th edition, Wiley Publications.
9. Manipal manual for AHS by Dr. Sampath Madhyastha, (Second Edition) Publishedby CBS Publishers.
10. Handbook of anatomy for nurses by Dr. P. Saraswathi.
11. Text book of anatomy BD-CHAURASIA-LATEST EDITION.
12. Theory and Practice of histological techniques by Bancroft(jd).

B21HA0202	HUMAN PHYSIOLOGY- II	L	T	P	C
Duration: 3 hrs/wk		3	0	0	3

Prerequisites:

Basis of excretory system, respiratory system, nervous system, gastrointestinal physiology and reproductive system

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To acquire knowledge on excretory system and muscular physiology
2. To know about the working of respiratory system
3. To learn about the gastrointestinal physiology
4. To learn about reproductive system in male and female and basis of contraception.

Course Outcomes:

CO1. Able to understand the physiology working of excretory system and muscular system
CO2. Able to understand the working of respiratory system, transport of oxygen and carbon dioxide and diseases affecting the respiratory system
CO3. Will acquire active knowledge on gastrointestinal physiology working understand the organs involved in digestion and gastrointestinal diseases and disorders

CO4. Achieve knowledge about reproductive organs menstrual cycle and contraception

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0202	CO1	3	2	2	2	1	1	2	3	2	1	2
	CO2	3	3	2	3	2	1	2	3	1	2	2
	CO3	2	3	2	3	1	2	2	2	1	1	2
	CO4	2	2	2	3	2	3	2	3	1	2	2

Course Contents:

UNIT-I **12Hrs**

Organs of Excretory System: Kidneys, Structure of Nephron, Mechanism of Excretion, Urine formation (Glomerular filtration and Tubular reabsorption), Clearance tests & values of insulin, PAH and urea clearance. Electrolytes: their balances and imbalances Introduction of acidosis and alkalosis Muscle nerve physiology, types of muscles, their gross structural and functional difference with reference to properties. Structure in brief, mechanism of muscle contraction, isotonic and isometric contractions, energy sources of muscle contractions, motor unit.

UNIT-II **12Hrs**

Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function, pulmonary circulation, respiratory muscles lungs volume and capacities, collection and composition of inspired alveolar and expired airs. Transport of oxygen and carbon dioxide. Brief account of respiratory regulation, Gas transport between lungs and tissues, Definition of hypoxia, dyspnoea, cyanosis, asphyxia and obstructive airways diseases

UNIT- III **12Hrs**

Gastrointestinal physiology: Organs of GIT and their structure & function, secretion, digestion,

absorption and assimilation, gastrointestinal hormones, physiology of digestion of carbohydrates, proteins & lipids, Structure & function of liver, spleen, gall bladder & pancreas, Jaundice, Cirrhosis & Pancreatitis.

UNIT-IV **12Hrs**

Reproductive System: male & female reproductive organs, Reproductive cycle in female including menstrual cycle sex hormones, secondary sexual characteristics, puberty, spermatogenesis, oogenesis, menstrual cycle, pregnancy, menopause, contraceptive measures. Basis of contraception.

References:

1. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition, Elsevier Publications
2. Sujit Chaudhury,(2011),Concise Medical Physiology,6th edition, NCBA
3. Sembulingam k,(2012),Essentials of Medical Physiology,6th edition, Jaypee Publications
4. Guyton and Hall,(2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier
5. Gerard J. Tortora and Bryan H. Derrickson, (Principles of Anatomy and Physiology,14th edition,Wiley publications
6. Textbook of Medical Physiology by G.K. Pal.
7. Review of Medical Physiology by Ganong.
8. Samson Wrights Applied Physiology.
9. Text book of Medical physiology by A.B. Das Mahapatra.

B21HA0203	**BIOCHEMISTRY-II**	**L**	**T**	**P**	**C**
Duration: 4 hrs/wk		**2**	**1**	**0**	**3**
Prerequisites:					

Basic concepts of macromolecules

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To acquire the knowledge of macromolecules
2. To recognize and understand their physical, chemical and biological properties of proteins

3. To define and label nucleic acids
4. To understand the concept and need of vitamins minerals

Course Outcomes:

CO1. Achieve knowledge on chemical elements and the difference between simple sugars and complexcarbohydrates and to understand the structure of amino acid and their function.

CO2. Illustrate the function of proteins, recognize the importance of the structure of a protein and the role of non-covalent bonds in maintaining the shape of a protein.

CO3. Learn and understand the fundamentals of nucleic acids in biochemical processes.

CO4. Get knowledge on vitamins minerals metals and their impact in health system

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0203	CO1	3	1	1	3	1	2	2	1	2	1	1
	CO2	3	1	1	3	1	2	2	1	1	1	2
	CO3	3	1	1	3	1	2	3	1	1	1	1
	CO4	3	1	1	3	1	2	2	1	2	2	1

Course Contents:

UNIT-I **12Hrs**

Carbohydrates: Classification, function, importance, structure, digestion & absorption. Lipids: Classification of lipids, Classification of fatty acids, Saturated & Unsaturated fatty acids, their biological functions, digestion and absorption, introduction of lipoproteins.

UNIT-II **12Hrs**

Amino acids: Classification, Structure, Properties and Biological functions. Proteins: Classification, function, importance, structure, digestion & absorption.

UNIT-III **12Hrs**

Nucleic acids: Structure, Function and types of DNA and RNA, Nucleotides, Nucleosides, Nitrogen bases, purines and pyrimidines and role of Nucleic acid. Overview of porphyrins, their precursors, primary and secondary disorders of Porphyrin metabolism – diagnostic laboratory methodologies including appropriate Specimen collection and preservation techniques related to porphyrins.

UNIT-IV **12Hrs**

Vitamins: classification, function and disease associated with vitamins, hypervitaminosis. Minerals and ions: Requirement, function and biological importance of Calcium, Iron, Iodine, Zinc,

Phosphorus, Copper, Sodium and Potassium.

Reference Books:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition, Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan, (2008), Essentials of Biochemistry, 2nd edition, Standard Publishers
6. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & III Tata McGraw Hill Publication.

B21HA0204	MICROBIOLOGY-II	L	T	P	C
Duration:4 hrs/wk		2	1	0	3

Prerequisites:

Knowledge of structure of bacteria and its classification

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To understand the fundamental aspects of bacteria.
2. To have an briefed idea on media composition and techniques employed regularly in lab practices
3. To illustrate about lab diagnosis with respect to bacteria
4. To acquire the knowledge about antibiotic susceptibility for testingof microorganisms

Course Outcomes:

CO1. Learn about the fundamental aspects of bacteria with respect to structure, function and composition and also types of bacterial growth

CO2. Acquire the knowledge on bacterial media compositions and culture techniques

CO3. Gain knowledge on differentiating bacteria and lab diagnosiswith respect to various bacterial cultures

CO4. Gain knowledge on antibiotic susceptibility testing by manual and automatic methods

Mapping of Course Outcomes with programme Outcomes

CourseCode	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0204	**CO1**	3	2	1	3	1	1	2	2	2	2	1
	CO2	3	2	2	3	1	1	2	2	1	2	2
	CO3	3	3	3	2	2	2	3	3	1	2	2
	CO4	2	3	3	3	2	2	3	3	2	2	1

Course Contents:

UNIT-I **12Hrs**

Bacteriology: Cell membrane: Structure, function and chemical composition of bacterial cell wall and membranes. Composition and detailed structure of Gram-positive and Gram- negative cell walls. Cytoplasm: Ribosome, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids, Endospore: Structure, formation. Growth and nutrition of bacteria: Growth of bacteria; Types of bacterial growth with definition of generation time; Growth curve; Multiplication of bacteria;Factors that affect bacterial growth, oxygen; requirement, carbon dioxide requirement, temperature, pH, light & osmotic effect.

UNIT-II **12Hrs**

Bacteriological Media & Culture Techniques: Introduction of culture media; Basic requirements & uses of culture media; Classification of culture media: Based on their consistency (solid, liquid, semisolid), Based on constituents/ingredients (simple, complex, synthetic or defined, special), Based on Oxygen requirement (aerobic & anaerobic media); Types of culture methods (streak culture, stab culture, pour plate method, spread plate broth culture); Anaerobic culture methods: Automated methods (Bactec- bloodculture method).

UNIT-III **12Hrs**

Description, morphology, pathogenecity, clinical features and lab diagnosis of Gram positive cocci – staphylococci, streptococci. Gram negative cocci – Neisseria, Gram positive bacilli – Corynebacterium, Mycobacterium, Actinomyctes, Listeria, Bacillus, Clostridia. Gram negative

bacilli–Enterobacteriaceae, Pseudomonas, Vibrio, Aeromonas, plesiomonas, Campylobacter, Bacteroides, Fusobacterium, Brucella, Haemophilus, Bordetella. Pasteurella, , Spirochetes, Chlamydia, Rickettsia, Mycoplasma, etc.

UNIT-IV **12Hrs**

Anti-microbial Agents, Sensitivity Testing & Antibiotic susceptibility testing: Introduction of antimicrobial agents; Definition of anti-microbial agents; classification and uses, Ideal qualities of an antimicrobial agent; Mechanism of action of anti-microbial drugs; Resistance of bacteria to antimicrobial drugs; Definition of antimicrobial sensitivity testing; Measurement of anti- microbial activity techniques in bacteriology; minimum inhibitory concentration and zone of inhibition.

Reference Books:

1. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
2. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

B21HA0205	PATHOLOGY- II	L	T	P	C
Duration:4 hrs/wk		3	1	0	4

Prerequisites:

Provide basis about blood,bank preservation techniques

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1.To learn about blood bank selection of donor criteria and anticoagulants
2.To grasp knowledge about various blood components and guidelines for HIV testing by NACO
3.To be aware about importance of vitamins minerals and infectious diseases
4.To know the of different types of anaemia

Course Outcomes:

CO1. Apply knowledge on about blood bank preservation techniques, and transfusion reactions
CO2. Get idea on blood components used in blood banks
CO3. Illustrate the basic concept of minerals vitamins related disorders, and infectious diseases

CO4. Conceptualize different types of anemia and lab diagnosis

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0205	CO1	3	1	2	2	--	1	1	--	1	1	2
	CO2	3	2	2	3	--	1	2	--	1	2	1
	CO3	3	3	2	1	--	1	2	--	2	1	2
	CO4	3	3	2	3	--	1	2	--	1	1	2

Course Contents:

UNIT-I **12Hrs**

Introduction to blood bank Donor selection criteria Blood components and its preparation, preservation, storage and transportation Blood transfusion reaction Introduction to stem cell and banking bone marrow transplantation. Basic Principles of Blood Banking, Antigen,Antibody, antigen antibody reaction types of antibodies Complement, different vacutainers and Anticoagulants

UNIT-II **12Hrs**

Transfusion transmissible infectious disease screen, Coomb'test, Cross matching, Compatibility testing, Agglutination. Apheresis, plasmapheresis, plateletspheresis,. Role of NACO and guidelines on HIV testing

UNIT-III **12Hrs**

Protein Structure of protein classification and types of proteins Role and effect of metals (Zinc, Iron and Calcium) and their deficiency diseases, etiology and pathophysiology of diabetes, arteriosclerosis, myocardial infarction, respiratory diseases (COPD), Parkinson disease. Infectious

Diseases: pathogenesis prevention treatment lab investigations available control with suitable examples like Typhoid, Dengue

UNIT-IV **12Hrs**

Anaemia and its classification, pathogenesis Megaloblastic anaemia, pernicious anaemia, Iron deficiency anaemia, Haemolytic anaemia, laboratory investigations treatment and prevention
and anaemia profile Thalassemia and hamoglobinopathies

Reference Books:

1. Essentials of Anatomic Pathology by Liag Cheng (2006)
2. Pettit JE and Hoffbrand AV. Essential Haematology. (Latest edition.) Blackwell Scientific
3. Dacie and Lewis. Practical Haematology (Latest edition. Churchill Livingstone.
4. Hoffbrand AV and Pettit JE. Clinical Haematology (Atlas) Gower Medical Publishing. London. (Latest edition)
5. Denise M. Harmening. Modern Blood Banking and Transfusion Practices (Latest edition)
6. Michael F. Murphy. Practical Transfusion Medicine (Latest Edition)
7. Goodright SH, Hathaway WE Disorder of Haemostasis and Thrombosis- A Clinical Guide. Latest edition, McGraw- Hill.
8. Harmening DM. Modern Blood Banking and Transfusion Practices. Latest edition. Jean-Francois Vilain.

B21LHM201	**Constitution of India & Professional Ethics**	L	T	P	C
Duration: 3 hrs/wk		0	0	0	2

Prerequisites:

Basic knowledge of Indian history.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective: After completing the course the student shall be able to

1. To gain knowledge on Constitution of India and to understand about the fundamental rights, duties and other rights which is been given by our law.
2. To prepare students in the understanding of Constitution perspective and make them face the world as a bonafide citizen.

Course Outcomes: After completing the course the student shall be able to

CO1: Analyze the Fundamental Rights, Duties and other Rights protected under Indian Constitution

CO2: Demonstrate the practicality of Constitution perspective.

CO3: Make the students face the world as a bonafide citizen.

CO4: Understand different union and state policies and their effect on industrialization in India.

Mapping of Course Outcomes with Programme Outcomes

Course Code	POs/COs	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
B21LHM201	CO1	2	2	3	3	1	2	3	1	1	1	2
	CO2	3	2	2	3	3	2	2	2	2		1
	CO3	2	3	3	3	3	2	3	3	2	1	2
	CO4	1	3	3	3	2	2	3	3	1		2

Course Content: **Total Hours: 48 hrs**

UNIT-1

12 Hrs

Introduction to Constitution of India. Role of Public Sector Undertakings in economicdevelopment... Public policy making in India and influence of new globalised world order. I.T. Law in India - Section 4-10 of I.T Act: Cyber laws in India - Section 43-47 of I.T Act -Section 65- 78 of I.T Act. E-Governance and role of engineers in E-Governance. Socialist policy of India and its relevance. Fundamental Duties of the Citizen, Significance and Characteristics. Elements of National Significance; National Flag, National Anthem, National Emblem.

UNIT-II

12 Hrs

Role of Planning Commission in economic development. Finance Commission and centre-State relations. Fundamental Rights and Fundamental Duties. Directive Principles of State Policy. Politics of Industrialization in India and the policy of Liberalization Privatization and Globalization (LPG) Need for reformed engineering serving at the Union and State level. Role of I.T. professionals in Judiciary. Problem of Alienation and Secessionism in few states creating hurdles in Industrial development.

UNIT-III **12Hrs**

Judiciary: Supreme Court of Indian, High Court, Right to Information Act 2005, Consumer Protection- Consumer Rights- Caveat Emptor and Caveat Venditor.

Unit-IV **12 Hrs**

Professional Ethics: Definition Scope and need of ethics for professional, Personal Ethics and Business Ethics, Ethical Standards, Duties of Employers and Employees. Due Care theory, Environmental Ethics, Ethical Code of Conduct in ethics. Best Ethical Companiesin India and Abroad; Corporate Social Responsibilities, Code of Conduct and Ethical Excellence

References:

1. An Introduction to the Constitution of India by: Brij Kishore Sharma
2. Relevant document related Government of India Policy.
3. Cyber Law by Dr. Gupta and Agarwal.
4. www.indiancourts.nic.in
5. Public Administration by Awasthi and Maheshwari.
6. M V Pylee, An introduction to Constitution ofIndia

B21HA0206	HUMAN PHYSIOLOGY-I	L	T	P	C
Duration: 3 hrs/wk	(Practical)	0	0	2	2

Prerequisites:

Students on Completion of human physiology they can understand process involved in humanphysiology

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1.To measure clotting time, bleeding time and blood pressure

2. To know and determine ABO blood group and venous blood collection

3.To study components and structures of pre-prepared slides of different tissues.

4.To know various blood components by centrifugation

Course Outcomes:

After completing the course the student shall be able to:

CO1. Identify components and structures of pre-prepared slides of different tissues

CO2. Learn individual clotting time, bleeding time and blood pressure

CO3. Learn about venous blood collection and determination of blood group

CO4. Separation of blood components through centrifugation

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0206	CO1	1	3	2	2	3	2	3	3	1	1	2
	CO2	1	3	3	3	1	1	3	3	2	2	1
	CO3	1	3	3	3	1	2	2	3	1	1	2
	CO4	2	3	2	3	1	2	2	2	2	2	1

Course Contents:

Practicals

1. Microscopic study of tissues- epithelial, connective and muscular.
2. Determination of Clotting Time, Bleeding Time
3. Blood pressure Recording
4. Determination of Blood Groups by ABO blood grouping
5. Identification of blood cells by leishman stain
6. Collection of blood sample- Capillary blood from finger tips and venous blood.
7. Separation of blood components (Centrifugation).

B21HA0207	CLINICAL POSTINGS-I	L	T	P	C
Duration: 5 hrs/wk		0	0	2	2

Prerequisites:

Students on Completion of clinical postings they can understand basic skills in laboratory process

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

Upon completing the clinical postings students will be able to demonstrate competency in various skills. These skills may be obtained in the outpatient, inpatient, and long term care settings

SEMESTER-III

B21HA0301	BIOCHEMISTRY-III	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Obtaining Knowledge on basic concepts of analytical chemistry

Course Objectives:

1. To understand principle working and use of centrifugation in biochemical experiments
2. To understand about the fundamental concept of electrophoresis
3. To Understand about chromatography its types and their applications
4. To Understand about the basic concept and use of photometry, turbidometry and radioactive elements

Course Outcomes:

CO1. Handle the centrifuge and spin the samples
CO2. Demonstrate and perform electrophoresis
CO3. Perform chromatography techniques and handling of HPLC
CO4. To know about action of radioisotopes

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0301	CO1	3	3	2	3	1	1	2	3	1	-	2
	CO2	3	3	2	3	1	1	2	3	2	1	2
	CO3	3	3	2	3	1	1	2	3	2	1	1
	CO4	3	3	2	3	1	1	2	3	1	1	2

Course Contents:

UNIT-I **12Hrs**

Centrifugation: Basic principles of centrifugation. RCF and sedimentation coefficient. Centrifugation, fixed angle and swinging bucket rotors, Types of centrifuge, differential

centrifugation, density gradient centrifugation and Ultracentrifugation.

UNIT-II **12Hrs**

Theory and types of electrophoresis, description of technique. Methods for detecting and quantitating separated zones of proteins. Role of electrophoretic technique in clinical biochemistry. Fundamental concepts of biophysical phenomena like osmosis, dialysis, colloidal state, viscosity, absorption, osmotic pressure, surface tension and their application in relation to the human body.

UNIT-III **12Hrs**

Chromatography – Basic concepts, Working principles, types and applications of Chromatography - Paper Chromatography- Ascending, descending and circular, Thin Layer Chromatography, Ion Exchange Chromatography, Affinity Chromatography, Gel Filtration Chromatography, Gas Chromatography, and HPLC and its importance in clinical biochemistry.

UNIT-IV **12Hrs**

Elementary concepts: radioactivity, radioisotopes, their application in medicines and agriculture isotopic dilution analysis, radioactivity counting techniques. Working Principles and application of flame photometry, turbidometry and atomic absorption spectroscopy.

Reference Books:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition, Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha Science
4. Lehninger, (2013), Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers
6. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
7. Text book of Medical Biochemistry by Ramakrishna
8. Text Book of Clinical chemistry by Norbert Teitz 4. Principles and Techniques of Practical Biochemistry by Wilson and Walker.
9. Clinical Chemistry - Principle and techniques by Rj Henry, Harper & Row Publishers.
10. Schaum's Outline of Biochemistry.Philip W. Kuchel, Ph.D, Simon Easterbrook-Smith, Vanessa Gysbers, J. Mitchell Guss
11. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology
12. Pearson's Biochemistry.Christopher K. Mathews, Kensal E. van Holde,Dean R. Appling,Spencer J. Anthony-Cahill
13. Biochemistry. Donald Voet, Judith G. Voet

B21HA0302	MICROBIOLOGY-III	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Basic knowledge of fungi structure its classification. and pathogenesis

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To learn the fundamental aspects of fungi with respect to structure, function and classification
2. To study about infections caused by fungi and lab diagnosis
3. To study about morphology, pathogenicity, clinical features and lab diagnosis of systemic mycoses
4. To study about morphology, pathogenicity, clinical features and lab diagnosis of opportunistic fungi with respect to diagnosis

Course Outcomes:

CO1. Ascertain about the fundamental aspects of fungus with respect to structure, function and classification

CO2. Acquire the knowledge of infections caused and lab diagnosis

CO3. Gain knowledge about morphology, pathogenicity, clinical features and lab diagnosis of systemic mycoses

CO4. Able to learn the morphology, pathogenicity, clinical features and lab diagnosis of opportunistic fungi with lab diagnosis

Mapping of Course Outcomes with programme Outcomes

Course Code	POS /	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3

	COs											
B21HA0302	CO1	3	3	2	3	3	2	1	2	1	2	2
	CO2	3	3	2	3	3	2	1	2	2	2	2
	CO3	3	3	2	3	2	3	1	2	2	1	1
	CO4	3	3	2	3	2	3	1	2	2	2	1

Course Contents:

UNIT-I **12Hrs**

Mycology: Introduction of Mycology: Definition, Ultrastructure of fungal cell**,** general properties and classification - Superficial, Sub-Cutaneous mycoses, Systemic mycoses, Opportunistic mycoses. Culture, Morphology and identification of contaminant and pathogenic fungi. Laboratory diagnosis of common superficial, subcutaneous, and deep fungal infections of man.

UNIT-II **12Hrs**

Definition of mycoses & Classification Morphology, Pathogenicity, Clinical features and lab diagnosis of:

1. Superficial Mycoses, Malsezzia furfur, Tinea nigra, Tinea pedis.
2. Subcutaneous Mycoses
3. Mycetoma
4. Rhinosporidium
5. Sporotrichosis
6. Dermatophytes
7. Microsporum
8. Epidermophyton
9. Trichophyton

UNIT-III **12Hrs**

Morphology, pathogenicity, clinical features and lab diagnosis of

Systemic Mycoses

1. Histoplasmosis
2. Blastomycosis
3. Coccidiodosis
4. Paracoccidiodosis

UNIT-IV **12Hrs**

Morphology, pathogenicity, clinical features and lab diagnosis of Opportunistic Fungi

1. Aspergillosis
2. Penicillosis
3. Zygomycosis
4. Pneumocystis
5. Mycotoxins

References:

1. Rippon – Medical Mycology
2. Emmons – Medical mycology
3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
4. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harleyand Klein's Microbiology. 9th edition. McGraw Hill Higher Education

B21HA0303	PATHOLOGY- III	L	T	P	C
Duration:4 hrs/wk		2	1	0	3

Prerequisites:

Knowledge on tissue formation inflammation microtomy and special stains

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To know the tissue structure formation and cancer nomenclature
2. To know about inflammation causes and mechanism of cell death
3. To learn about the errors that occur during microtomy
4. To understand the principle and procedure of special stains employed in histopathology

Course Outcomes:

CO1 . Understand the formation of tissues causes of cancer diagnosis and treatment

CO2. Gain knowledge on changes that occur during cell death

CO3. Able to apply basic knowledge and prevent errors that occur during section cutting

CO4. Will acquire active knowledge of special staining techniques involved in histopathology

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0303	CO1	3	1	1	1	1	1	1	--	1	1	2
	CO2	3	1	1	2	1	1	2	--	2	2	1
	CO3	2	3	2	2	--	1	2	--	1	1	2
	CO4	1	3	3	3	--	1	2	--	2	1	1

Course Contents:

UNIT-I **12Hrs**

Introduction of histopathology, Tissue Renewal and Repair, healing and fibrosis, cirrhosis, introduction of oedema, hyperaemia, congestion, Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, concept of oncogenes, tumour suppressor genes.

UNIT-II **12Hrs**

Tissue and its types, Location and function, Causes and mechanisms of cell injury, reversible and irreversible injury. Introduction of hyperplasia, hypoplasia, hypertrophy, atrophy, metaplasia, necrosis and apoptosis. General features of acute and chronic inflammation: Vascular changes, Phagocytosis and its mechanism.

UNIT-III **12Hrs**

Grossing of tissues, tissue processing and its steps, manual and automated method, components & principle of automatic tissue processor. Processing of bones Embedding media, its type and properties. Microtome, its type and working, various type of microtome, Microtome knives, its type and knife sharpening, Section cutting, fault and remedies, Section adhesive.

UNIT-IV **12 Hrs**

Haematoxylin and eosin staining, , mounting and mounting media, advantages & disadvantages. Decalcification, decalcification methods, types of decalcifying fluid.Staining of carbohydrates: PAS staining, Alcian blue, staining of glycogen, Amyloid, other staining method Connective tissue & its staining: Trichrome staining, , WeigertResorcin stain, Gordon's and Sweet stain, Gomori's method, PTAH stain.

References:

1. Quick reference handbook for surgical Pathologists by Justin A Bishop and Natasha
    a. Rekhtam (2011)
2. Pathology and The Pathology of Neoplasia, Paul Bogner 2014
3. Histology for Pathologist by Stacey E Mills MD, 4th edition, 2012
4. Wheater's Basic Pathology: A Text, Atlas and Review of Histopathology by Geraldine O'Dowd (latest edition) @ Wheater's Basic Histopathology by Alan Stevens. James S. Lowe, Barbara Young., 6th edition, 2014
5. Theory and Practice of Histological Techniques. Bancroft JD and Stevens A..
    a. Churchill Livingstone., 7th edition, 2013.
6. The Practice of Surgical Pathology: A beginners's guide to the diagnostic process
    a. by Diana Weedman Molavi, 2008.
7. Rosai, Juan. Rosai and Ackerman's Surgical Pathology. Tenth ed. 2 vols: Mosby
    a. Elsevier, 2011.
8. Lester, Susan C. Manual of Surgical Pathology. Third ed.: Mosby, 2010

B21HA0304	BIOCHEMISTRY IN DAILY LIFE (OPEN ELECTIVE)	L	T	P	C
Duration: 4 hrs/wk		2	0	0	2

Prerequisites:

Fundamental understanding of DNA, RNA, Proteins, Carbohydrates and conception of food and medicines.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

The overall objectives of the course are:

- To provide the students with theoretical information on micronutrients, water and electrolytes in nutritional biochemistry and their functions in metabolism.
- To develop knowledge about malnutrition and obesity
- To impart knowledge about various diseased conditions and their prevention

Course Outcomes:

After completing the course, the student should be able to

CO1 - Attain knowledge about importance of water, macro and micro nutrients, malnutrition and obesity.

CO2 - Analyse the causes, symptoms of various diseased conditions and their prevention.

CO3 - Understand the report of blood biochemical test

CO4 - Analyse the symptom of different diseases in human being

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0304	CO1	1	2	3		2	3		3	2	2	1
	CO2	1	2	2			2	3	3	2	1	1

	CO3	2	2	3		2	3			1	2	1
	CO4	2	3	2			3		3	1	2	2

Course Contents:

Unit 1 **12 hrs**

Nutrition

Water; General consideration, role of water in diet. Nutritional importance of Energy, Body building and Protective foods (Vitamins and Minerals) Dietary fiber. Malnutrition diseases, Overweight and obesity.

Unit 2 **12 hrs**

Diseases 1

Incidence, symptoms, Prevention and dietary management. of various Diseases:

Diabetes, diseases of Liver, & Pancreas-Hepatitis: alcoholic liver diseases. Renal disease: Acute and Chronic renal failure. Dialysis, medical and nutrition therapy.

Unit 3 **12 hrs**

Diseases 2

Incidence, symptoms, Prevention and dietary management. of various Diseases:

Gastrointestinal diseases, Gastritis, Peptic, stomach and duodenal ulcer, Diarrhoea, constipation. Cancer and HIV/AIDS: Types, stages of cancer, and colon cancer. HIV infection and social issues.

Unit 4 **12 hrs**

Interpretation of Diagnostic Reports

Commonly used bio chemical tests for diagnosis of various diseases and their interpretation. Total blood count, Blood glucose and urea; serum lipid–cholesterol, LDL and HDL triglyceride, and serum proteins. Urine creatinine, Glucose and protein (albumin). Enzymes: SGPT, SGOT

Reference Books:

1. Physical Biochemistry. Kansal Edward Van Halde. Prentice Hall.
2. Practical Clinical Biochemistry, ed. Harold Varley, 4th edn. CBS Publishers (1988).
3. Practical Clinical Biochemistry: Methods and Interpretation, ed. Ranjna Chawla, Jaypee Brothers Medical Publishers (1996).
4. Practical and Clinical Biochemistry for Medical Students, ed. T.N. Pattabhiraman, Gajanna Publishers (1994).
5. Hawk's Physiological Chemistry, ed. Oser, 14th Edn.(1976), Tata-McGrawHill.
6. Kuby Immunology; Oven, Punt, Stranford, 7th Edn. W. H. Freeman (2013).
7. Hepatology- A clinical text book by k Mauss, Berg, Rockstroh, Sarrazin, Wedemeyer H (2017)
8. Hepatology: a Textbook of Liver Disease, 4th edition by Zakim, Boyer 2003.
9. Text book of Diabetes 5th edition by Richard I. G. Holt, Clive Cockram, Allan Flyvbjerg, Barry J. Goldstein John Wiley & Sons 2011.
10. Molecular Biology of the Cell; 6 thEdn. Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter; Garland Science (2014).

B21HA0305	SKILL DEVELOPMENT (HEALTH CARE)	L	T	P	C
Duration: 2 hrs/wk		2	0	0	2

Prerequisites:

Fundamentals of health personal hygiene and environmental sanitation

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. Know the principles of Communication for health and educating the patients for acute and chronic diseases.

2. Apply the principles of environmental and occupational health in the design of health programmes aimed at improving health status.

Course Outcomes:	90

CO1. Develop the awareness of health care system in various aspects.

CO2. Able to aware about environment sanitation and maintaing the hygenic condition.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0305	CO1	3	1	1	1	1	1	1	--	2	1	1
	CO2	3	1	1	2	1	1	2	--	2	2	2

Course Contents:

UNIT I

Health Education- Meaning, Definition, Objectives and Importance

Communication for Health - Information: Definition and Components.The process of communication.Methods & media of communication.The concept of Information Education and communication (IEC) for health.Health Ethics.

Patient Education for Common Acute Diseases - Dental Diseases, Diarrhea, Vomiting. Cough, Cough & breathlessness (Bronchitis), Asthma, Skin Diseases (e. g. scabies, boils and infected wounds).

Patient Education in Chronic Diseases – Diabetes, Asthma and Chronic Bronchitis, Hypertension, Arthritis, Ischemic Heart Disease, Obesity, Cancers, Other Chronic Diseases.

Sexuality Education and Family Life Education- Prevention of STDs (Syphilis, Gonorrhoea, Pelvic Inflammatory Disease (PID)). Prevention & control of HIV/AIDS.

UNIT II

Personal Hygiene- Essentials of personal hygiene including personal grooming, Hand washing and its importance, Methods and pitfalls in hand washing, Prevention of food poisoning through proper personal hygiene.

Environmental Sanitation- Essentials of sanitation, Human faeces – methods of appropriate disposal, Faecal – oral contamination and Faecal – oral diseases, Methods of sanitation and hygiene to break faeco – oral transmission of diseases, Disposal of solid and liquid waste.

Public Relations in Health Care Service Institutions - Principles of Public Health. Immunization. National Health Programmes. Importance of Human Relationship in Healthcare Institutions.

Definition of public relation.Role and importance of public relations in health care service institutions.Role of General Health Assistant (GHA) in the hospitals.Staff-patient relationship.Doctor-patient relationship.Personal hygiene of hospital staff.Empathy Vs sympathy in patient care.

Reference Books:

1. Control of Communicable Diseases in Man: Benenson A S
2. Manson's Tropical Diseses:Cook G, Zumla A
3. Hunters Tropical Medicine and emerging infectious diseases: Strickland GT
4. Training modules of various national & international institutes and national health programmes.

B21HA0306	BIOCHEMISTRY-I (Practicals)	L	T	P	C
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

Students should have studied **B21MT1060, B21MT2060, B21MT1040, and B21MT204**

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To learn about the collection biological samples like blood, urine and gastric juices
2. To learn about the preparation of reagents
3. To learn about the analysis of carbohydrates and aminoacids
4. To have an basic idea on Protein precipitation, and separation of proteins

Course Outcomes:

CO1. Able to understand the collection of various samples

CO2. Achieve knowledge on preparation of reagents used in biochemistry

CO3. Learn about the methods of analyzing macromolecules like carbohydrates and aminoacids

CO4. Able to understand Protein precipitation

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Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0306	CO1	3	3	3	3	1	1	3	2	2	1	1
	CO2	3	2	1	3	1	3	1	3	2	1	2
	CO3	3	1	1	3	1	3	1	2	2	2	1
	CO4	3	3	3	3	1	3	2	3	1	1	2
	CO5	3	3	2	3	1	3	1	2	2	1	2
	CO6	3	3	1	3	1	3	2	2	2	2	1

Course Contents:

Practicals

1. Collection of blood, Urine and Gastric juice, separation of serum and plasma and Deproteinization of blood sample
2. Preparation of different percentage solutions, Molar and Normal solutions
3. Demonstration of photocolorimeter , spectrophotometer and pH meter
4. Qualitative analysis of carbohydrates
5. Qualitative analysis of proteins and amino acids
6. Protein precipitation, and separation of proteins

B21HA0307	MICROBIOLOGY-I (Practical)	L	T	P	C
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

Students should have studied **B20MT1050**

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1.To learn about the microscope its parts and glassware's used and gram stain prcedure microbiology lab
2.To learn about autoclave hot air oven its procedure and working
3. To learn about different methods of sterilization employed in microbiology lab
4.To learn about various culture media used in microbiology lab

Course Outcomes:

CO1. Learn microscope its parts and also glassware's used in Micro-biologylab

CO2. Gain knownledge on principle and working of autoclave and hot air oven

CO3. Acquire the knowledge about different Sterilization methods employed in lab

CO4. Acquire the knowledge of various media used for the identification of Micro-organisms in microbiology lab

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0307	CO1	3	3	2	2	1	2	2	2	2	2	1
	CO2	3	3	2	2	1	3	2	2	1	1	2
	CO3	3	3	1	2	1	2	3	3	2	1	2
	CO4	3	3	1	2	1	3	3	3	2	1	1

Course Contents:

1. Demonstration of Microscope and its parts
2. Demonstration of glassware used in microbiology and gram staining
3. Demonstration of autoclave and sterilization of glass wares.
4. Demonstration of Hot air oven, Laminar air flow, Centrifuge and sterilization of glass wares.
5. Demonstration of commonly used culture media - Nutrient broth, Nutrient agar, Blood agar, Mac conkey medium, LJ media, Robertson Cooked meat media

B21HA0308	PATHOLOGY-I (Practical)	L	T	P	C
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

Students should have studied **B21MT1060, B21MT2060**

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To discuss about the steps involved in processesing a tissue sample
2. To know various fixatives its classification and embedding
3. To understand the working of microtome cryostat and various knives used in histopathology
4. To understand the process of decalcification and processesing of bones

Course Outcomes:

CO1. Learn steps involved in processesing a tissue sample
CO2. Gain knowledge on various fixatives its classification and embedding
CO3. Get knowledge on working of microtome cryostat and various knives used in histopathology
CO4. Gain knowledge on understand the process of decalcification and processesing of bones

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0308	CO1	1	3	2	2	--	1	2	--	2	1	1
	CO2	1	3	3	2	--	--	1	--	2	2	1
	CO3	2	3	2	3	--	--	--	--	1	1	2

Course Objectives:

1. Tissue processing, dehydration and clearing.
2. Labeling, fixation, properties of fixing fluids, classification and composition of fixing fluids.
3. Embedding. Water soluble substances, properties of embedding media
4. Equipment for sectioning microtome, knife, honing and stropping. Types, care and use of microtome.
5. Technique for sectioning – frozen section. Technique for sectioning – Paraffin embedded tissue.
6. Technique of processing bone

SEMESTER-IV

B21HA0401	BIOCHEMISTRY-IV	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Students should have studied **B21MT1060, B21MT2060**

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To understand the basic knowledge in clinical laboratory of automation and selection of appropriate instruments and reference values for specimens in medical laboratory

experiments

2. To understand about the fundamental concept of Quality Management system
3. To understand the importance of kidney function test in medical laboratory
4. To understand the analytical tools used in medical laboratory for gastro intestinal diseases

Course Outcomes:

CO1. Perform clinical laboratory of automation and selection of appropriate instruments
CO2. Acquire active knowledge of fundamental concept of Quality Management system
CO3 Perform kidney function test in medical laboratory
CO4. Perform tests for gastro intestinal diseases

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / Cos	PO1	P 2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0401	CO1	3	3	2	3	1	2	2	3	1	1	2
	CO2	3	3	2	3	1	2	2	3	2	2	1
	CO3	3	3	1	3	1	1	2	2	1	1	2
	CO4	3	3	1	3	1	1	2	2	2	2	1

Course Contents:

UNIT-I **12Hrs**

Overview of approaches to clinical laboratory automation and its goal- general concepts used in automated instruments and specific applications of these concepts to selected instruments. Criteria to be used in evaluating and selecting appropriate laboratory instrumentation. Definition and concepts of reference values and related terminology – selection of individuals for determination of population based reference values- criteria for specimen collection and procedure for collecting data.

UNIT-II **12Hrs**

Quality Management system: Introduction, Quality assurance, Quality control system, Internal and

External quality control, quality control chart ,Biomedical Introduction and importance of calibration and Validation of Clinical Laboratory instrument, Ethics in relation to Pre-Examination procedures, Examination procedures, reporting of results, preserving medical records Procurement of equipment and Inventory Control, Good Laboratory Practice (GLP) ,Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation Overview of application of the computer in clinical Biochemistry laboratories.

UNIT-III **12 Hrs**

Kidneys and their physiological role – Laboratory tests to assess, detect and monitor renal diseases. Overview of calcium and inorganic phosphate metabolism current laboratory and their Analytical assessment.

UNIT-IV **12Hrs**

Laboratory tests and analytical methods used in identification and evaluation of hepatobiliary disorders, stomach, pancreas and intestinal tract – procedure and tests used in the diagnosis and treatment of gastro intestinal diseases.

Reference Books:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry, 8th edition, Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha Science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers
6. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
7. Text book of Medical Biochemistry by Ramakrishna
8. Text Book of Clinical chemistry by Norbert Teitz 4. Principles and Techniques of Practical Biochemistry by Wilson and Walker.
9. Clinical Chemistry - Principle and techniques by Rj Henry, Harper & Row Publishers.
10. Schaum's Outline of Biochemistry.Philip W. Kuchel, Ph.D, Simon Easterbrook-Smith,

Vanessa Gysbers, J. Mitchell Guss
11. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology
12. Pearson's Biochemistry.Christopher K. Mathews, Kensal E. van Holde,Dean R. Appling,Spencer J. Anthony-Cahill
13. Biochemistry. Donald Voet, Judith G. Voet

B21HA0402	MICROBIOLOGY-IV	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Students on Completion of Study about Basics Of Parasites And Protozoans

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. To learn the fundamental aspects of parasites and various methods used to isolate parasites in a medical laboratory
2. To study about Protozoa and its sub classifications and also morphology, pathogenicity, and lab diagnosis
3. To study about nematodes their morphology, pathogenicity, clinical features and lab diagnosis
4. To study about Platyhelminthes their morphology, pathogenicity, clinical features and lab diagnosis

Course Outcomes:

CO1. Identify and demonstrate parasites

CO2. Acquire the knowledge of Protozoa and its sub classifications and also morphology, pathogenicity, clinical features and lab diagnosis different organisms related to Protozoa

CO3. Acquire the knowledge of nematodes and their morphology, pathogenicity, clinical features and lab diagnosis

CO4. Acquire the knowledge about morphology, pathogenicity, clinical features and lab diagnosis of Platyhelminthes.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS /	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3

B21HA0402	CO1	3	2	3	3	1	1	2	3	1	1	2
	CO2	2	3	2	3	1	1	2	3	2	2	1
	CO3	3	3	2	2	1	1	2	3	1	1	2
	CO4	2	3	1	3	1	1	2	3	1	2	2

Course Contents:

UNIT-I 12Hrs

Introduction to Parasitology, parasite and types of parasitism (Comensalism, Symbiosis, Predatorism, Phoresis and Mutualism). Types of Hosts (Final, intermediate, paratenic and reservoir), vector, host parasite relationship and classification

UNIT-II 12Hrs

Protozoa: Classification, general morphology, biology, mode of transmission, pathogenicity, laboratory diagnosis and prophylaxis of protozoan parasites: Entamoeba, Nagleria fowleri Giardia lamblia, leishmania Trypanosoma spp, Plasmodium spp, Balantidium

UNIT-III 12Hrs

Classification, general morphology, biology, mode of transmission, pathogenicity, laboratory diagnosis and prophylaxis cryptosporidia microsporidia isospora cestodes Diphyllobothrium aenia solium and echinococcus

UNIT-IV: Classification, general morphology, biology, mode of transmission, pathogenicity, laboratory diagnosis and prophylaxis trematodes Fasciola,schistoma nematodes enterobius Ascaris

a. Trematodes - S. haematobium & F. hepatica (in brief)

References:

1. Chatterjee – Parasitology – Interpretation to Clinical medicine.
2. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition
3. W.H. Freeman and Company, New York. Company, London.
4. Medical Parasitology – AjitDamle
5. Text Book of Parasitology by K.D. Chatterjee, Chatterjee medical Publishers, Calcutta.-4
6. Text book of Medical Parasitology by S.C. Parija.-4
7. Parasitic diseases in man by Richard Knight English Language Book Society (ELBS)-4
8. Medical Microbiology by R. Cruickshanketal, Vol.I ELBS-4

B21HA0403	PATHOLOGY- IV	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Knowledge about various disease causing parasites different types of leukemia and platelet disorders

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. To know about anaemia blood parasites and its lab diagnosis
2. To learn about sickle cell anaemia, etiology, pathogensis and laboratory investigation
3. To know about leukamia, types of leukamia and their laboratory investigation
4. To understand about platelets and its related disorders, and lab diagnosis

Course outcomes:

CO1. Able to understand about blood pathogen infection, diagnosis and prevention
CO2. Perform sickle cell anaemia, preparation for diagnosis
CO3. Able to differentiate leukemia,and its lab diagnosis
CO4. Identify different platelet disorders .

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PSO1	PSO2	PSO3
B21HA0403	CO1	3	2	2	1	--	1	--	--	1	2	2
	CO2	2	2	2	2	--	--	--	--	2	2	1
	CO3	3	1	1	2	--	1	1	--	1	1	2
	CO4	2	3	3	1	--	1	--	--	1	2	2

Course Contents:

UNIT-I **12Hrs**

Aplastic anaemia, Anaemia of chronic disorders, Sideroblastic anaemia, Haemolytic Anaemia, pathogenesis, laboratory investigations, Bone marrow examination, composition & functions,

processing and staining. LE cells, its demonstrationand significance, lupus Blood parasites, Malaria, Trypanosomes, Filariasis, Leishmania

UNIT-II **12Hrs**

Hemoglobinopathies, Sickle cell anaemia, etiology, pathogenesis, clinical features, and laboratory investigations, Disease management haemoglobin electrophoresis. Tests available for RBC detection

UNIT-III **12Hrs**

Leukemia and its classification, WHO and FAB classification, AML, ALL, CML, CLL, its etiology, clinical features, laboratory investigations Cytochemistry involved in diagnosis of various types of leukemia.

UNIT-IV **12Hrs**

Disorders of platelets, Disorders of secondary hemostasis, hemophilia and its lab diagnosis, Von-Willebrand disease, Disseminated intravascular coagulation, haemorrhage, thrombosis, embolism, infarction, shock and hypertension

Reference Books:

1. Leach M, Drummond M, Doig A. Practical Flow cytometry in Haematology Diagnosis. Latest edition, Wiley Blackwell Publisher
2. Bain BJ. Haemaglobinopathy Diagnosis. Latest edition. Blacwell Publishing.
3. Weatherall, DJ, Clegg JB The Thalassaemia Syndromes. Latest edition Wiley Blackwell Publisher

4. Parslow TG, Stites DP, Terr Al, Imboden JB. Medical Immunology. Lange Medical b. Books/McGraw-Hill Medical Publishing Division. c. Stites DP, Terr Al, Parslow TG. Basic & Clinical Immunology (latest edition). Lange
5. The Biology of Cancer (2013) by Robert A Weinberg. ISBN: 13: 9780815342205 / ISBN: 10: 0815342209.

B21HA0404	PHARMACOLOGY	L	T	P	C
Duration: 4 hrs/wk		2	0	0	2

Prerequisites:

Basis of pharmacology including mechanism of drug delivery drug action and excretion

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course objectives:

1.To know basic pharmacology, drug action, Metabolism and excretion, related to pharmacology

2.To learn about drug action site either nervous system or local, different type of drug like Analgesics, antipyretics, anti-inflammatory agents and antirheumatic

Course outcomes:

CO1. Gain the knowledge about various drugs and their administration
CO2. Gain knowledge about drugs used for diseases affecting Respiratory System and GIT

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / Cos	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0404	CO1	3	3	2	1	1	1	2	3	1	2	2
	CO2	2	3	3	2	1	1	2	2	1	1	2

Course Contents:

Course Contents

UNIT-I

Introduction of Pharmacology, Routes of Drug Administration, Pharmacokinetics Pharmacodynamics, Drug Toxicity and Safety, Cholinergic Drugs, Anti- Cholinergic drugs, Neuromuscular Blocking Drugs, Adrenergic Drugs, Adrenergic Receptor Antagonists. General Anesthesia, Local Anesthesia, Sedatic, Opiods, NSAIDs, RA Drugs, Parkinsonism, Antiepileptic Drugs Congestive Heart Failure (CHF) Drugs, Antihypertensive, Antianginal Drugs, Hypolipidemic, Diuretics.

UNIT- II:

Bronchial Asthma Drugs, Pharmacotherapy of Cough, Antihistaminic Antiemetics, Laxatives and Anti Diarrheal. Hematinic, Anticoagulants, Antiplatelets Drug, Fibrinolytics and Anti Fibrinolytics Corticosteroids and Anti Diabetic Drugs.

References:

1. Fundamentals of experimental Pharmacology by Dr. M.N. Ghosh.
2. Essentials of Medical Pharmacology by Tripathi (KD)

B21HA0405	SOFT SKILL TRAINING	L	T	P	C
Duration: 3 hrs/wk	(Computer Basics)	2	0	0	2

Prerequisites:

Acquire knowledge on basics of computer parts and working

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To understand the components of computer and basic knowledge in operating them.
2. To know about the software related to work in computer system and basic programming.

Course Outcomes:

CO1. Learn to operate the computer from the hard ware and software knowledge that are gained.

CO2. Ready to work on Microsoft word, excel, PowerPoint and basic programming.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / Cos	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0405	CO1	3	3	2	1	1	1	2	3	2	1	2
	CO2	2	3	3	2	1	1	2	2	1	1	2

Course content: **52hrs**

UNIT – 1: **12Hrs**

General features of a Computer. Generation of computers. Personal Computer, workstation, Mainframe Computer and super Computers. Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.

Computer organization. Central processing unit. Computer memory primary memory and secondary memory. Secondary storage devices – magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse. Modem.

Computer hardware and software. Machine language and high level language. Application software. Computer program. Operating system. Computer virus, antivirus and Computer security. Elements of MS DOS and Windows OS. Computer arithmetic. Binary, octal and hexadecimal number systems. Algorithm and flowcharts. Illustrations. Elements of database and its applications.

UNIT – 2: **12 hours**

Word processing and electronic spread sheet. An overview of MS WORD, MS EXCEL and MS POWERPOINT. Elements of BASIC programming. Simple illustrations. Network of computers. Types of networks. LAN, Intranet and Internet. Internet applications. World Wide Web. E-mail, browsing and searching. Search engines. Multimedia applications.

List of Practical Assignments:

1. System use, keyboard, mouse operations. Word pad and paint brush. Creating a folder and saving a document.

2. Simple MS. DOS commands.

3. Windows operating system – icons, menus and submenus, my computer.

4. Desktop publishing – preparation of a document using MS.WORD.

5. Installation of a software, virus scanning – illustrations.

6. Spreadsheet calculations using MS.EXCEL.

7. BASIC programming – illustrations.

8. Internet use. Surfing, browsing, search engines, E-mail.

Reference Books:

1. Alexis Leon and Mathews Leon (1999): Fundamentals of information technology, Leon Techworld Pub.

2. Jain, S.K. (1999): Information Technology "O" level made simple, BPB Pub.

3. Jain, V.K. (2000): "O" Level Personal Computer Software, BPB Pub.

4. Rajaraman, V. (1999): Fundamentals of Computers, Prentice Hall India.

5. Hamacher, Computer Organisation, Mc Graw.

6. Sinha, Computer Fundamentals, BPB Pub.

B21HA0406	BIOCHEMISTRY-II (Practicals)	L	T	P	C
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

knowledge on diabetic panel and electrolytes

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. To learn about the Urine analysis
2. To learn the quantitative analysis of urine glucose and GTT
3. To learn about diagnosis of inborn errors of metabolism
4. To get knowledge on electrolytes and use of rapid strips

Course Outcomes:

CO1. Perform urine analysis
CO2. Demonstrate perform urine glucose and GTT
CO3. learn the impact of errors in metabolism and tests used for its detection
CO4. Perform electrolytes profile and usage of rapid strips

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / Cos	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3

B21HA040	CO1	3	3	1	3	1	2	3	1	1	2	1

6	CO2	3	3	1	3	1	2	3	1	1	1	2
	CO3	3	3	1	3	1	2	3	1	1	2	2
	CO4	3	3	1	3	1	2	3	1	1	1	1
	CO5	3	3	1	3	1	2	3	1	1	2	1

Course content:

1. Urine analysis
2. Quantitative test for urine glucose and GTT
3. Estimation of non-protein nitrogenous compounds of blood: Blood urea, creatinine, creatinine clearance test (CCT)
4. Screening for inborn errors of metabolism
5. Estimation of Blood sugar, Blood Urea and electrolytes
6. Demonstration of Strips and demonstration of Glucometer

B21HA0407	**MICROBIOLOGY-II (Practicals)**	**L**	**T**	**P**	**C**
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

Knowledge about identification classification of microorganisms and antibiotic susceptibility

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. To know about preparation of media and isolation of pure culture by various methods
2. To know various biochemical tests used to identify the genus and species of bacteria
3. To know and understand the principle and procedure of AFB Endospore and hanging drop methods
4. To grasp the knowledge on antibiotic sensitivity test

Course Outcomes:

CO1. isolation bacteria

CO2. Perform biochemical tests manually

CO3. Perform AFB Endospore and hanging drop methods

CO4. Perform antibiotic sensitivity test by manual method

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / Cos	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA040 7	CO1	3	3	1	3	1	2	3	1	1	2	1
	CO2	3	3	1	3	1	2	3	1	1	1	2
	CO3	3	3	1	3	1	2	3	1	1	2	2
	CO4	3	3	1	3	1	2	3	1	1	1	1
	CO5	3	3	1	3	1	2	3	1	1	2	1

Course content:

1. Isolation of Bacteria
2. Identification of bacterial cultures- colony characteristics, Biochemical tests for identification
3. To perform Acid fast staining (Zeihl Neelsen staining)
4. To perform endospore staining
5. To perform Hanging drop method
6. Antibiotic sensitivity test – Kirby Bauer Method

B21HA0408	**PATHOLOGY- II (Practicals)**	**L**	**T**	**P**	**C**
Duration: 4 hrs/wk		**0**	**0**	**2**	**2**

Prerequisites:

know about determining PCV, ESR and transfusion medicine

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. To know about PCVWBC counting and ESR analysis of RBC
2. To make smear of peripheral and bone marrow
3. To know procedure of blood collection and storage
4. To analyse blood group and confirmation by forward grouping and reverse grouping

Course Outcomes:

CO1. Ready to do RBC, WBC counting and ESR analysis of RBC
CO2. Ready to prepare a peripheral smear stain and examine
CO3. To gain knowledge about procedure of blood collection and storage
CO4. Able to Perform forward grouping and reverse grouping

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / Cos	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0408	CO1	1	3	2	2	--	--	1	--	2	2	2
	CO2	1	3	3	2	--	--	1	--	1	2	1
	CO3	2	2	2	2	--	1	1	--	2		1
	CO4	1	2	2	1	--	--	1	--	1	2	2

Course content:

1. Principles and methods of determining PCV calculation and interpretation of red cell indices.
2. ESR: introduction, factors affecting ESR, principles and methods of determining ESR, increasing and decreasing conditions of ESR.

3. WBC: introduction, diluting fluids of WBC Absolute eosinophil count procedure

4. Preparation of peripheral thin smear Buffy coat smear,. Romanowsky group of stain..
5. Preparation of donor for blood collection isolation of various blood components
6. Forward grouping and reverse grouping procedure

References:

1. Leach M, Drummond M, Doig A. Practical Flow cytometry in Haematology Diagnosis. Latest edition, Wiley Blackwell Publisher
2. Bain BJ. Haemaglobinopathy Diagnosis. Latest edition. Blacwell Publishing.
3. Weatherall,DJ, Clegg JB The Thalassaemia Syndromes. Latest edition Wiley Blackwell Publisher
4. Parslow TG, Stites DP, Terr Al, Imboden JB. Medical Immunology. Lange Medical b. Books/McGraw-Hill Medical Publishing Division. c. Stites DP, Terr Al, Parslow TG. Basic & Clinical Immunology (latest edition). Lange
5. The Biology of Cancer (2013) by Robert A Weinberg. ISBN: 13: 9780815342205 / ISBN: 10: 0815342209.

B21HA0409	**CLINICAL POSTINGS**	**L**	**T**	**P**	**C**
Duration: 6 hrs/wk		0	0	2	2

Prerequisites:

Students who undergoes will be able to elicit the appropriate focused history and identify the characteristic symptoms associated with diagnoses across the lifespan. Also develop the ability to recommend and interpret appropriate diagnostic studies/findings.

SEMESTER -V

B21HA0501	BIOCHEMISTRY- V	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Basic Concepts of Enzymes, terminologies with respect to enzymesand classification of enzymes.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. To understand the basic knowledge of enzymes and coenzymes in relation with biochemical processes
2. To understand about the fundamental concept of Co-enzymes
3. To Understand about the basia and principle of enzyme kinetics
4. To understand the basic knowledge of various analysers used in biochemistry and its applications

Course Outcomes:

CO1. knowledge about structure, classification and the mechanism of enzymes.

CO2. Learn about the basic and application of coenzymes in biochemical processes

CO3. Ascertain the knowledge about enzyme kinetics and enzyme inhibitors as well as isoenzymes and their clinical significance.

CO4. Gain knowledge about automation along with the maintenance of clinical chemistry analyzers used in hospital laboratory.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS /	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3

	COs											
B21HA0501	CO1	3	1	1	3	1	2	2	1	2	1	2
	CO2	3	1	1	3	1	2	2	1	2		1
	CO3	3	1	1	3	1	2	2	1	2	2	1
	CO4	3	2	3	3	1	1	2	3	2	1	1

Course content:

UNIT-I **12Hrs**

Introduction to enzymes, classification of Enzymes, concept of lock and key and induced fit theory.

Concept of activation energy and binding energy. Factors affecting enzyme activity.

UNIT-II **12Hrs**

Coenzyme: Classification, various types and function, structure of NAD+, NADP+, FAD and FMN, PPP. UNITs for measuring enzyme activity, factors affecting enzyme level in serum/ plasma. Clinical assay & its type, kinetic assay and end point assay for the enzymes.

UNIT-III **12Hrs**

Enzyme kinetics, the Michaelis-Menten equation and its physiological significances, Enzyme Inhibition, types of inhibitors of enzyme. Isoenzymes, their tissue distribution and clinical significance: ALT, AST, ALP, GGT, CPK, CK-MB, LDH, troponin, myoglobin, amylase, Lipase, ACP.

UNIT-IV **12Hrs**

Basic Concepts of Automation, principle, working and maintenance of various clinical chemistry analyzers, point of care testing, Hospital Laboratory Management.

References:

1. D M Vasudevan, (2011), Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde, (2012), Text book of Medical Biochemistry,8th edition, Jayppe Publications
3. Singh & Sahni, (2008), Introductory Practical Biochemistry,2nd edition, Alpha science

4. Lehninger, (2013), Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan, (2008), Essentials of Biochemistry,2nd edition, Standard Publishers
6. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & IIITata McGraw Hill Publication.
7. Text book of Medical Biochemistry by Ramakrishna
8. Text Book of Clinical chemistry by Norbert Teitz 4. Principles and Techniques of Practical Biochemistry by Wilson and Walker.
9. Clinical Chemistry - Principle and techniques by Rj Henry, Harper & Row Publishers.
10. Schaum's Outline of Biochemistry.Philip W. Kuchel, Ph.D, Simon Easterbrook-Smith, Vanessa Gysbers, J. Mitchell Guss
11. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology
12. Pearson's Biochemistry.Christopher K. Mathews, Kensal E. van Holde, Dean R. Appling,Spencer J. Anthony-Cahill
13. Biochemistry. Donald Voet, Judith G. Voet

B21HA0502	MICROBIOLOGY-V	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Students on Completion of study will acquire knowledge on structure of virus and its classification.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. To learn the fundamental aspects of virology (including morphology, properties, and classification) and taxonomy of virology
2. To study about viral diseases and Diagnosis methods
3. To study about oncogenic viruses (DNA and RNA related)
4. To study about antiviral compounds and viral vaccination with examples Ascertain about

Course Outcomes :

CO1. Know about the fundamental aspects of virology (including morphology, properties, and classification) and virology taxonomy

CO2. To identify and conceptualise viral diseases and its Diagnosis

CO3. Acquire the knowledge about oncogenic viruses (DNA and RNA related)

CO4. Acquire the knowledge of antiviral compounds and viral vaccination with examples

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0502	CO1	3	2	2	3	1	2	3	3	1	1	1
	CO2	2	3	3	3	1	3	2	2	1	1	2
	CO3	3	2	3	3	1	2	2	3	2	1	1
	CO4	2	3	3	3	1	2	2	3	2	1	1

Course content:

UNIT-I **12Hrs**

Virology: Introduction: Discovery of viruses, nature and definition of viruses, Morphology, General properties, Classification of DNA and RNA Virus, viroids, virusoids and Prions. Viral taxonomy: Classification and nomenclature of different groups of viruses, Modes of viral transmission.

UNIT-II **12Hrs**

Common viral diseases –Structure, pathogenesis, Symptoms, Diagnosis of HIV, Hepaptitis A and B, Influenza, Chicken pox, Polio, Rabies, Measles, Mumps, Dengue, Ebola, Chikungunya, Japanese Encephalitis.

UNIT-III **12Hrs**

Introduction to oncogenic viruses, DNA viruses -Human Papilloma Virus and Epstein-Barr virus and Oncogenic RNA Viruses- Hepatitis-C Virus, HumanT-cell lymphotropic virus(HTLV),concepts of oncogenes and proto-oncogenes.

UNIT-IV **12Hrs**

Antiviral compounds, classification with examples and their mode of action, interferon and their mode of action, General principles of viral vaccination with examples.

References:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
4. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education
6. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
7. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

B21HA0503	BIOSTATISTICS AND PATHOLOGY- V	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Basis of biostatistics normal probability distribution Exfoliative cytology and vaccines

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. To know Basic knowledge of biostatistics
2. To know about the normal probability distribution
3. To learn about Exfoliative cytology collection of body fluids and its diagnosis
4. To know about vaccine, cell & humoral mediated response, and immunohistochemistry

Course Outcomes:

CO1. Able to understand the concept of biostatistics
CO2. Gain knowledge about the normal probability distribution
CO3 Collection of Various body fluids and its diagnosis
CO4. Different types of vaccine, and basis of Immunohistochemistry,

and cancer immunotherapy

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0503	CO1	3	1	1	1	--	--	--	--	1	1	2
	CO2	2	3	2	2	1	--	1	--	2	1	1
	CO3	3	3	2	2	--	--	--	--	2	1	1
	CO4	3	1	1	2	--	--	--	--	2	2	1

Course content:

UNIT-I **12Hrs**

Definition, Biostatistics Population and sample, sampling techniques and types of samples, sample size calculation, statistics and parameters.

Types of Data: Tabulation, Organization, and Graphical Representation of Quantitative & Qualitative data. Measures of Central Tendencies: Mean, Median, Mode. Measures of Variability; Range, Interquartile deviation (Q.D.), Standard deviation (S.D.), Mean deviation (M.D.), and Coefficient of Variation.

UNIT-II **12Hrs**

Normal Probability Distribution, Properties of normal probability curve, Correlation & Types of correlation, Scatter Diagram. Principles of hypothesis testing, Types of error, SE, CI, Level of significance, Power of the Test, P Value, Randomization. Parametric tests: Z test, t-test. One-way ANOVA test. Chi-Square test; Mann- Whitney test

UNIT-III **12Hrs**

Aspiration and exfoliative cytology, Processing and Staining FNAC, Progressive & Regressive, Staining Collection and processing of sputum, BAL,CSF, Pleural, peritoneal and pericardial fluid, its lab diagnosis and side effects

UNIT-IV

Cell block and cytospin technique, staining such as PAP, Diff-quick, MGG Shorr staining, significance of PAPHPV, Destaining and restaining of slides, Cover slipping Introduction of Immunohistochemistry: principle, antigen retrieval, Procedure and its applications

Antibody-mediated response, vaccines, cell-mediated response, Interferons, cytokines, hormones, enzymes, antibodies and derivatives in anti-infective and cancer therapy. Cancer immunotherapy.

References:

1. Leach M, Drummond M, Doig A. Practical Flow cytometry in Haematology Diagnosis. Latest edition, Wiley Blackwell Publisher
2. Bain BJ. Haemaglobinopathy Diagnosis. Latest edition. Blacwell Publishing.
3. Weatherall,DJ, Clegg JB The Thalassaemia Syndromes. Latest edition Wiley Blackwell Publisher
4. Parslow TG, Stites DP, Terr Al, Imboden JB. Medical Immunology. Lange Medical b. Books/McGraw-Hill Medical Publishing Division. c. Stites DP, Terr Al, Parslow TG. Basic & Clinical Immunology (latest edition). Lange
5. The Biology of Cancer (2013) by Robert A Weinberg. ISBN: 13: 9780815342205 / ISBN: 10: 0815342209.
6. Research Methodology Methods and Techniques; C.R. Kothari ; 2nd edition ; New Age International ; 1990 (republished in 2009).
7. Statistics (Theory and Practice) ; B.N. Gupta ; Agra : Sahitya Bhavan ;
8. Research Methodology Methods and Statistical Techniques; Santosh Gupta; New Delhi: Deep & Deep Publications; 2000.
9. Biostatistics – A Foundation for Analysis of Health Sciences; Wayne Daniel; 9thedition; New Jersey : John Wiley and Sons, Inc.; 2009.

10. Methods in Biostatistics ; B. K. Mahajan ; Jaypee book house ; 7th edition;
11. Biostatistics ; K. Vishwerhwara Rao

B21HA0504	SOFT SKILL TRAINING (Communicative Medicine)	L	T	P	C
Duration: 3 hrs/wk		2	0	0	2

Prerequisites:

Students should have good knowledge on the current scenario of diseases its epidemiology prevention and treatment

.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. Know the structure and functioning of the health system at the National levels and its historical perspectives.
2. Identify the socio-cultural dimension in Health and disease.

Course Outcomes:

CO1. By knowing the principles of health Information System and applying this knowledge in facilitating the learning process in groups of people involved in health.

CO2. Socio -cultural dimension knowledge helps in designing and implementation of an integrated Health and development program.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0504	CO1	1					3	2	2	2	1	1
	CO2						2		2	2		1

Course content:

Unit 1 **6 hrs**

Concept of Health & Disease. History of medicine, evolution of public health, alternative systems

of medicine. Definition and concepts of public health. Holistic concepts of health including concept of spiritual health, appreciation of health as a relative concept. Health profile of India.

Unit 2 **6 hrs**

Determinants of health characteristics of agent, host and environmental factors in health and disease and the multifactorial etiology of disease. Understanding the natural history of disease and application of interventions at various levels of prevention. Health indicators.

Unit 3 **6 hrs**

Social and Behavioral Sciences- Clinico-social, cultural and demographic evolution of the individual, family and community Humanities and Community Medicine Social organizations with special reference to family Religion, its evolution as a special instance of the evolution of social institutions. Major tenets of the common religions in India & their influence on health & Disease.

Unit 4 **6 hrs**

Assessment of barriers to good health and health seeking behavior. Health economics Doctor patient relationship.Social problems e.g. child abuse, juvenile delinquency, drug addiction, alcoholism, marital maladjustment, domestic violence, suicide and attempted suicide. Psychology and its concepts The Psycho analytic theory, Human personality, its foundations, development and organization.Hospital psychology.

Reference Books:

1. Oxford Text book of Public Health: Detels R, McEwen J, Beaglehold R
2. Control of Communicable Diseases in Man: Benenson A S
3. Manson's Tropical Diseses:Cook G, Zumla A
4. Hunter's Diseases of Occupations: Baxter PJ, Admas PH
5. Hunters Tropical Medicine and emerging infectious diseases: Strickland GT
6. An introduction to sociology: Bhusan and Sachdeva
7. Clinical Epidemiology- the Essentials : Fletcher
8. Epidemiology and Management for Health Care for all: Sathe PV, Sathe AP
9. Training modules of various national & international institutes and national health programmes

B21HA0505	BIOCHEMISTRY- III (Practicals)	L	T	P	C
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

About knowledge of various enzymes present in the body

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. To learn about the enzyme analysis (amylase, Alkaline Phosphatase, Acid Phosphatase, SGOT, SGPT, LDH and CPK) on auto analyser
2. To learn the estimation of enzyme related to cardiac profile
3. To learn about Arterial blood gas
4. To get knowledge of ACP estimation and Antenatal profile

Course Outcomes:

CO1. Acquire the knowledge of enzyme investigation
CO2. Acquire the knowledge on quantification of enzyme related to cardiac profile
CO3. Learn basics of Arterial blood gas analysis
CO4. Acquire the knowledge about ACP assessment and Antenatal profile

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0505	CO1	3	3	1	2	1	2	3	3	1	2	2
	CO2	3	3	1	2	1	2	3	3	1	1	1
	CO3	3	3	1	2	1	2	3	3	2	1	1
	CO4	3	3	1	2	1	2	3	3	2	1	2

Course content:

1. Enzymes: amylase (salivary and Pancreatic), Alkaline Phosphatase, Acid Phosphatase, SGOT, SGPT, LDH and CPK- demonstration on auto analyzer.
2. Determination of Troponin I
3. To perform estimation of ACP.

4. Antenatal profile.
5. Estimation of bicarbonate.
6. Arterial blood gas analysis in an analyser

B21HA0506	MICROBIOLOGY-V (Practicals)	L	T	P	C
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

Prior knowledge on parasitology mycology and transfusion medicine

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objective:

1. To learn about saline and iodine mount methods (parasitology) used in microbiology lab
2. To learn about the identification of fungal cultures (mycology)
3. To learn about serological tests performed in microbiology lab
4. To learn about anaerobic culture methods

Course Outcomes:

CO1. Acquire the knowledge of saline and iodine mount methods for the recovery of parasites

CO2. Identification of various fungi (mycology)

CO3. Able to perform serological tests such as WIDAL ASO RA Crp manually

CO4. knowledge on anaerobic culture methods

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0506	CO1	3	3	2	3	1	2	3	2	2	1	1
	CO2	3	3	2	3	2	1	3	3	2	2	1
	CO3	2	3	2	3	1	1	3	3	1	1	2
	CO4	1	3	2	1	1	2	2	2	1	2	2

Course content:

1. **Parasitology**:
   a) Saline mount
   b) Iodine mount

2. **Mycology:**
   a) Slide culture technique
   b) KOH mount
   c) Identification of fungal cultures
      Colony characteristics and Microscopic examination of Candida, Cryptococcus, Trichophyton, Microsporum, Aspergillus Niger, Asp fumigatus, Fusarium, Penicillium

3. Demonstration of common serological tests – WIDAL, VRDL, ASO RA C - reactive protein test.
4. Anaerobic culture methods.

B21HA0507	PATHOLOGY-III (Practicals)	L	T	P	C
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

Acquire ideas on basics of techniques such as electrophoresis parasites and compatibility testing

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1.To know procedure of detection of abnormal hemoglobin by electrophoresis

2. To learn about diagnosis of platelet disorders

3. To be aware on parasites causing diseases in humans its morphology and clinical significance

4. To have an idea about the tests which are done before an transfusion is done

Course Outcomes:

CO1. Demonstrate of abnormal hemoglobin by electrophoresis.

CO2. Perform platelet count

CO3. Identification of blood parasites in blood
CO4 Perform Cross matching and Compatibility test

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0507	CO1	1	3	3	2	--	1	1	1	1	1	2
	CO2	1	3	3	2	--	1	1	1	2	2	1
	CO3	1	3	3	2	--	1	1	1	2	1	2

Course content:

1 Methods of identification of abnormal hemoglobin including by HB electrophoresis and Alkali denaturation Test.

2 EBV Infection diagnosis

3 Thrombocytopenia, thrombocythemias, platelet count.

4 Various methods of demonstrating LEcells Malaria, LD bodies, microfilaria and methods of demonstration

5 Cross matching. Compatibility test - direct and indirect Coomb's test

B21HA0508	**CLINICAL POSTINGS**	**L**	**T**	**P**	**C**
Duration: 6 hrs/wk		0	0	2	2

Prerequisites:

Students who undergoes will be able to elicit the appropriate focused history and identify the characteristic symptoms associated with diagnoses across the lifespan. Also develop the ability to recommend and interpret appropriate diagnostic studies/findings.

SEMESTER-VI

B21HA0601	MEDICAL ETHICS & BIOCHEMISTRY- VI	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Diverse knowledge on hospital accreditation ethics and hormonal analysis

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To understand and obtain basic knowledge about Ethics practiced
2. To understand about the Audit in a Medical Laboratory
3. To understand about thyroid function test to diagnose thyroid disorders
4. To understand the importance of Infertility profile

Course Outcomes:

CO1. Familiar and apply ethical principles while working in a laboratory
CO2. Able to face auditing in lab
CO3. Perform and estimate thyroid Panel
CO4. Able to Perform tests related to Infertility profile

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0601	CO1	3	2	2	3	1	2	1	2	2	2	1
	CO2	3	3	1	3	1	3	1	2	1	1	2
	CO3	3	3	1	3	1	3	1	2	2	2	1
	CO4	3	3	1	3	1	3	1	2	1	1	2

Course content:

UNIT-I **12Hrs**

Ethical Principles and standards for a clinical laboratory Awareness/Safety in a clinical laboratory, General safety precautions. HIV: pre- and post-exposure guidelines, Hepatitis B & C: pre- and post-exposure guidelines, Drug Resistant Tuberculosis Patient management for clinical samples collection, transportation and preservation

UNIT-II **12Hrs**

Audit in a Medical Laboratory, Introduction and Importance, NABL & CAP, Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation. Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation

UNIT-III **12Hrs**

Hormones, classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion, mechanism of action.

Infertility profile: LH, FSH, Estradiol progesterone, testosterone, free testosterone, Prolactin, their estimation and clinical significance, and reference range

UNIT-IV **12Hrs**

Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, determination of T3, T4, TSH, Disorder associated with thyroid dysfunction. Growth hormone, ACTH, aldosterone, cortisol their estimation and clinical significance, Introduction of toxicology, alcohol poisoning, lead poisoning, zinc poisoning, mercury poisoning drug abuse, screening procedure for drug screening, and spot tests

Reference Books:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition, Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha Science
4. Lehninger, (2013), Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers
6. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
7. Text book of Medical Biochemistry by Ramakrishna
8. Text Book of Clinical chemistry by Norbert Teitz 4. Principles and Techniques of Practical Biochemistry by Wilson and Walker.
9. Clinical Chemistry - Principle and techniques by Rj Henry, Harper & Row Publishers.
10. Schaum's Outline of Biochemistry.Philip W. Kuchel, Ph.D, Simon Easterbrook-Smith, Vanessa Gysbers, J. Mitchell Guss
11. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology
12. Pearson's Biochemistry.Christopher K. Mathews, Kensal E. van Holde,Dean R. Appling,Spencer J. Anthony-Cahill
13. Biochemistry. Donald Voet, Judith G. Voet
14. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications
15. Bishop(2013),Clinical Chemistry,7th edition, Wiley Publications
16. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier

B21HA0602	MICROBIOLOGY-VI	L	T	P	C
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Exclusive knowledge about surveillance biosafety controlling nosocomial infection and biomedical waste management

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To learn the fundamental aspects of biosafety (importance, principles and guidelines)

2. To study about Sterility testing in water and disinfectants
3. To study about nosocomial infection and role of microbiology lab in controlling it

4. To study the fundamental aspects of biomedical waste management in a medical microbiology laboratory and hospital

Course Outcomes:

CO1. Acquire the knowledge about the fundamental aspects of biosafety (principles guidelines and use)
CO2. Perform Sterility testing in water and disinfectants
CO3 Gain knowledge about nosocomial infection and role of microbiology lab in controlling it

CO4. Differentiate of biomedical waste and disposal

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0602	CO1	3	2	3	3	2	3	2	1	1	1	2
	CO2	3	3	3	2	2	2	2	3	2	2	1
	CO3	3	3	2	3	3	2	1	2	1	1	1
	CO4	2	2	3	3	3	2	1	3	1	1	2

Course content:

UNIT- I **12Hrs**

Biosafety-Definition, Importance, Principles of Biosafety- Laboratory practices and procedures for the Microbiology laboratory, Biosafety guidelines, 4 Biosafety levels, safety equipment, facility

UNIT- II **12Hrs**

Sterility testing of dialysis water RO water disinfectant evaluation for bacterial contamination, Recording the result and interpretation.

UNIT- III **12Hrs**

Nosocomial Infection:

Introduction, sources and types of Nosocomial infection, Bacteriological surveillance of hospital environment. Role of Microbiology lab in control of nosocomial infection.

UNIT- IV **12Hrs**

Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated and their sources, Types of Hospital Risk Wastes, Hospital Non- Risk Waste, Risk from Waste, Techniques to Segregation of Waste, Treatment, Disposal Lab organization, management, recording of results and quality control in Medical Microbiology Lab. Safety measures in Microbiology Laboratory.

References:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
4. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education
6. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
7. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
8. Laboratory bio safety manual, World Health OrganizationGeneva 2004

B21HA0603	**PATHOLOGY- VI**	**L**	**T**	**P**	**C**
Duration: 4 hrs/wk		2	1	0	3

Prerequisites:

Derive Knowlegde about cytogenetics museum techniques electron microscopy and special stains employed in histopathology

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To understand cytogenetics, chromosomes classification and karyotyping procedure
2. To get knowledge about museum techniques principle working and sample preparation of electron microscopy
3. To grasp knowledge on antibodies its derivatives cytokines interferons its derivatives and clotting tests
4. To describe the principles and methods used to identify microorganisms in tissue samples by special stains employed in histopathology

Course Outcomes:

After completing the course the student shall be able to

CO1. Differentiate chromosomes classification and Perform karyotyping procedure

CO2. List the important steps involved in museum techniques and electron microscopy

CO3. Differentiate different types of antibodies its derivatives and demonstrate clotting tests

CO4. Perform special stains for identifying bacteria in tissue samples

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0603	CO1	3	1	1	1	--	1	2	--	2	1	2
	CO2	3	1	--	--	3	2	3	--	1	2	2
	CO3	1	2	2	2	--	--	1	--	1	2	2
	CO4	1	2	1	2	--	--	1	--	1		2

Course content:

UNIT-I **12Hrs**

Introduction to cytogenetics, terminology, classification and nomenclature of human chromosomes. Methods of karyotypic analysis. Culture of bone marrow cells, peripheral blood lymphocytes, solid tumors

UNIT-II

Museum techniques sample receiving preparation and storage Microscopy Electron microscopy:

SEM TEM Principle sample preparation and working,

12Hrs

UNIT-III **12Hrs**

Antibody-mediated response, vaccines, cell-mediated response, Interferons, cytokines, hormones, enzymes, antibodies and derivatives in anti-infective and cancer therapy. Cancer immunotherapy. PT, INR APTT, and Thrombin time.

UNIT-IV **12Hrs**

Demonstration of minerals and pigments in tissue sample, Demonstration of lipids, Demonstration of enzymes, Demonstration of microorganism in tissue specimens Bacteria, AFB, Actinomyctes, spirochetes, fungi. Demonstration of nucleic acids.

Reference Books:

1. Leach M, Drummond M, Doig A. Practical Flow cytometry in Haematology Diagnosis. Latest edition, Wiley Blackwell Publisher
2. Bain BJ. Haemaglobinopathy Diagnosis. Latest edition. Blacwell Publishing.
3. Weatherall,DJ, Clegg JB The Thalassaemia Syndromes. Latest edition Wiley Blackwell Publisher
4. Parslow TG, Stites DP, Terr Al, Imboden JB. Medical Immunology. Lange Medical b. Books/McGraw-Hill Medical Publishing Division. c. Stites DP, Terr Al, Parslow TG. Basic & Clinical Immunology (latest edition). Lange
5. The Biology of Cancer (2013) by Robert A Weinberg. ISBN: 13: 9780815342205 / ISBN: 10: 0815342209.

B21HA0604	BIOCHEMISTRY-VI (Practicals)	L	T	P	C
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

Elementary knowledge of various tests used to diagnose problems in heart kidneys and liver

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To learn about the estimation of liver enzymes and lipid profile
2. To learn about the estimation of electrolytes
3. To learn about the estimation of renal profile
4. To learn about the estimation of cardiac markers

Course Outcomes:

After completing the course the student shall be able to

CO1. Acquire and perform LFT and lipid profile
CO2. Perform the electrolytes panel using clinical samples
CO3. Perform the renal profile tests
CO4. Explain and demonstrate cardiac markers

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	PO 7	PO8	PSO 1	PSO2	PSO3
B21HA0604	CO1	3	3	1	2	1	2	3	3	1	1	1
	CO2	3	3	1	2	1	2	3	3	1	2	2
	CO3	3	3	1	2	1	2	3	3	1	1	2
	CO4	3	3	1	2	1	2	3	3	2	1	1

Course content:

1. Liver function tests (estimation of bilirubin – total conjugated direct SGOT SGPT)
2. Determination of lipids such as total cholesterol triglycerides HDL LDL and total cholestrol

3. Determination of electrolytes such as , sodium bicarbonate chloride potassium using blood samples
4. RFT(estimation of urea creatinine and BUN)
5. Cardiac markers (estimation of troponin CK-MB)

B21HA0605	MICROBIOLOGY-IV (Practicals)	L	T	P	C
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

Knowledge about virology techniques

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1. To learn about the biomedical waste management code framed by the pollution board followed in hospitals
2. To learn about TORCH profile a screening test
3. To learn about the embryonated egg inoculation for isolation of virus
4. To learn about the ELISA technique used to detect influenza, dengue, chikungunya HIV, Hepatitis and confirmatory test for HIV

Course Outcomes:

After completing the course the student shall be able to

CO1. Recognize the growing importance of appropriate waste disposals in hospital

CO2. Explain the TORCH profile

CO3. Explain the various methods of viral isolation in hens egg

CO4. Perform ELISA technique used to detect influenza, dengue, chikungunya HIV, Hepatitis and confirmatory test for HIV

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0605	CO1	3	3	3	2	1	2	2	3	1	2	2
	CO2	2	3	3	1	1	3	2	3	1		2

	CO3	2	3	3	1	1	3	2	3	1	2	2
	CO4	2	3	3	1	1	2	3	3	1	1	1

Course content:

1. Visit to hospital for demonstration of biomedical waste management.
2. TORCH profile.
3. Demonstration of embryonated egg inoculation.
4. Virology exercise: ELISA test for HIV, Hepatitis B, Western blot.
5. Diagnostic test for Influenza, Dengue, Chikungunya.

B21HA0606	PATHOLOGY-IV (Practicals)	L	T	P	C
Duration: 4 hrs/wk		0	0	2	2

Prerequisites:

Students should have studied concept of different types of stains.

Pedagogy

Mode of teaching using ICT/Writing in the broad

Course Objectives:

1.To know about preparation of hematoxylin and eosin stain preparation used in histopathology diagnostic laboratory

2.To know about special stains that are used to visualize collagen reticulin elastin and fat

3.To know about special stains that are used to visualize pigments like bile, minerals like calcium and stains for bacteria including AFB, and fungi

4.To know about Stains used to visualize the neuronal components

Course Outcomes:

After completing the course the student shall be able to

CO1. Demonstarate hematoxylin and eosin stain preparation

CO2. Gain knowledge of stains used for visualizing muscular components

CO3. Learn and apply knowledge on stains used to visualize pigments

CO4. recognize the importance of stains used to visualize the neuronal components

Mapping of Course Outcomes with programme Outcomes

Course Code	POS / COs	PO1	P 2	PO 3	PO4	PO5	PO6	P 7	PO8	PSO1	PSO2	PSO3
B21HA0606	CO1	1	3	3	2	--	1	1	1	1	2	2
	CO2	1	3	3	2	--	1	1	1	2	1	2
	CO3	1	3	3	2	--	1	1	1	2	1	1

Course content:

1. H & E staining procedure Types of hematoxylin its preparation. Eosin stock stain and its preparation
2. Demonstration of collagen, reticulin, elastin and fat
3. Demonstration of pigments and minerals (bile, calcium, iron,copper).
4. Stains for bacteria including AFB, and fungi,
5. Demonstration of neuron, myelin and axon.

B21HA0607	**INTERNSHIP**	**L**	**T**	**P**	**C**
Duration: 8 Wks		0	0	4	4

CAREER DEVELOPMENT AND PLACEMENT

Having a degree will open doors to the world of opportunities for you. But Employers are looking for much more than just a degree. They want graduates who stand out from the crowd and exhibit real life skills that can be applied to their organizations. Examples of such popular skills employers look for include:

1. Willingness to learn
2. Self motivation
3. Team work
4. Communication skills and application of these skills to real scenarios

5. Requirement of gathering, design and analysis, development and testing skills
6. Analytical and Technical skills
7. Computer skills
8. Internet searching skills
9. Information consolidation and presentation skills
10. Role play
11. Group discussion, and so on

REVA University therefore, has given utmost importance to develop these skills through variety of training programs and such other activities that induce the said skills among all students. A full-fledged Career Counseling and Placement division, namely Career Development Center (CDC) headed by well experienced senior Professor and Director and supported by dynamic trainers, counselors and placement officers and other efficient supportive team does handle all aspects of Internships and placements for the students of REVA University. The prime objective of the CDC is to liaison between REVA graduating students and industries by providing a common platform where the prospective employer companies can identify suitable candidates for placement in their respective organization. The CDC organizes pre-placement training by professionals and also arranges expert talks to our students. It facilitates students to career guidance and improve their employability. In addition, CDC forms teams to perform mock interviews. It makes you to enjoy working with such teams and learn many things apart from working together in a team. It also makes you to participate in various student clubs which helps in developing team culture, variety of job skills and overall personality.

The need of the hour in the field of Medical Laboratory Technology is knowledge in the subject, but also the skill to do the job proficiently, team spirit and a flavour of innovation. This kept in focus, the CDC has designed the training process, which will commence from second semester along with the curriculum. Special coaching in personality development, career building, English proficiency, reasoning, puzzles, and communication skills to every student of REVA University is given with utmost care. The process involves continuous training and monitoring the students to develop their soft skills including interpersonal skills that will fetch them a job of repute in the area of his / her interest and march forward to make better career. The School of Applied sciences also has emphasised subject based skill training through lab practice, internship, project work, industry interaction and many such skilling techniques. Special training is also arranged for those interested in entrepreneurial

venture. The students during their day to day studies are made to practice these skill techniques as these are inbuilt in the course curriculum. Concerned teachers also continuously guide and monitor the progress of students.

The University has also established University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director to facilitate skill related training to REVA students and other unemployed students around REVA campus. The center conducts variety of skill development programs to students to suite to their career opportunities. Through this skill development centre the students shall compulsorily complete at least two skill / certification based programs before the completion of their degree. The University has collaborations with Industries, Corporate training organizations, research institutions and Government agencies like NSDC (National Skill Development Corporation) to conduct certification programs. REVA University has been recognised as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana.

The University has also signed MOU's with Multi-National Companies, research institutions, and universities abroad to facilitate greater opportunities of employability, students' exchange programs for higher learning and for conducting certification programs.

LIST OF FACULTY MEMBERS

Sl No.	Name of the Teacher	Designation	Contact No.	E-mail
1	Dr. Jayashree S	Professor & Head	8610123372	jayashree.s@reva.edu.in
2	Dr. Gale Kathleen Edward	Visiting faculty	9901994545	galekathleen@gmail.com
3	Dr. Sujatha K	Visiting faculty	9916287074	sujathambbs@gmail.com
4	Dr. Kruthika	Associate Professor	9632364632	kruthika.s@reva.edu.in
5	Ms.Juliet Jothimani	Assistant Professor	6380740972	juliet.jothimani@reva.edu.in
6	Mrs. Pooja Karkera	Assistant Professor	9741224361	poojar.karkera@reva.edu.in
7	Mrs.Meghana M V	Assistant Professor	8867413830	meghana.mv@reva.edu.in